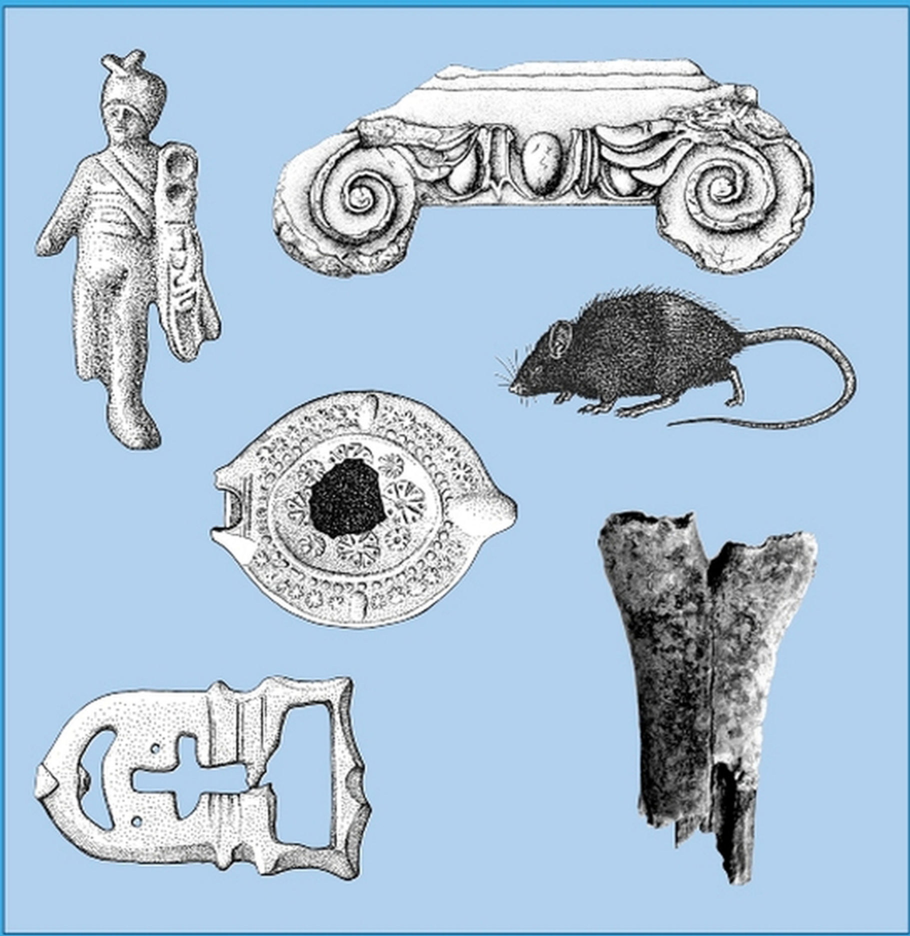
NICOPOLIS AD ISTRUM

A LATE ROMAN AND EARLY BYZANTINE CITY



THE FINDS AND BIOLOGICAL REMAINS

A. G. POULTER

Reports of the Research Committee of the Society of Antiquaries of London, No. 67

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with contributions from

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Special thanks are due to the contributors to this volume, all of whom persevered, without financial help from the excavation fund. I wish to acknowledge, in particular, the contribution made by Tom Blagg who finished the final revisions to his manuscript shortly before his untimely death. As a good friend and a great scholar, he is missed by many and with good reason. Mark Beech not only contributed reports to this volume but also co-ordinated the environmental programme as a whole.

The illustrators, who produced the publication drawings during the field-seasons in Bulgaria, worked in often difficult conditions and merit special commendation for their achievement; Paul Stroud, Helen Jeffries and Kirsty Norman. In Britain, Jane Goddard added to the corpus of final drawings for publication and more than matched the high standards set by those who had joined the field team. David Taylor also drew finds. Moreover, he successfully organized and assembled the large number of drawings and contributed the advice and practical knowledge which underpins the publication of the illustrations. Dr A. Jones has spent a year working with me on the final revisions of the texts. Her painstaking attention to detail and determination have contributed enormously to the final publication.

To all the above and the others who have offered advice and assistance in the preparation of this volume, I offer my heartfelt thanks. As in all successful outcomes, it is the combination of team-work and individual responsibility which achieves the best results.

PREFACE

This, the third and final monograph completes the description of the excavations carried out by the British team on the site of the Roman city of Nicopolis ad Istrum in northern Bulgaria. The reports which follow detail the results from two key aspects of the research programme; providing a full description of finds assemblages (including 6,231 finds records) from well-dated deposits and reconstructing the ancient site's natural setting and changing economic fortunes based upon a comprehensive archaeobiological programme, using primarily archaeobotanical and zooarchaeological remains. Included also are studies on the molluscs and the evidence for metallurgical activity in the ancient city. Apart from the importance of these studies for the immediate region, very little research of this kind – and on this scale – has taken place within the Balkans as a whole. These reports therefore offer a rare insight into the palaeoeconomy and material culture of an urban centre in the Roman, late Roman and early Byzantine periods.

The reports are intended both for specialists working within the region, and for those seeking comparative information on aspects of the economy or site-finds from this part of the Roman Empire. Since such information is rarely available for the Balkan provinces, it is necessary to publish as full an account as possible. Of particular importance is the inclusion of dating and context descriptions for all finds and the publication with the specialist reports of sufficient data (in the form of tables and figures) to allow the reader to judge the validity of the overall conclusions. Those who require additional information (archive data sets for the specialist reports or context and small-find records from the excavations) may consult the full electronic archives held by the Archaeology Data Service. Those who wish to gain on-line access should apply to help@ads.ahds.ac.uk.

For the ancient city of Nicopolis, the historical interpretation of the excavations and the significance of the site rely heavily upon the conclusions contained in this volume. Already in print is the first volume on the excavations, geophysics, frescoes, coins and inscriptions (Poulter 1995), published by the Society for the Promotion of Roman Studies, and the second on the pottery by R. K. Falkner and on the glass by J. D. Shepherd (Poulter 1999), published by the Society of Antiquaries of London.

A.G.P

THE STRUCTURE AND PRESENTATION OF THE REPORT

The material here presented falls into two main sections: the finds from the excavations, and the archaeobotanical remains, followed by a contribution on slag deposits and metal-working. The evidence is presented for all periods of occupation, from the Roman to early Byzantine period, and including the early medieval and post-medieval settlements.

The compilation and writing of these reports involved lengthy and often complex discussion and exchanges of information between the director and specialists. It is to the credit of all of the contributors that they persevered in the task of producing final reports even though, after the conclusion of the excavations in 1991, there were no funds to support staff and only modest help was available for expenses. Although some of the specialists have been fully involved with the original fieldwork, the task of analyzing the results was especially difficult for those who had not participated in the excavations and who had to undertake additional study in order to understand the recording methods used, the process of the excavation and the character of the site; Zlatozar Boev, Johnna Buysse, Helen Bush, John Chapman, Martin Henig, Simon Parfitt and Chris Salter.

The director was responsible for providing the dating evidence for all finds and the interpretation of the contexts from which they came. In addition to editing the following contributions, the director has added new relevant sources of information which have appeared since the original reports were submitted. Rarely, in the finds sections, the director has added a comment after the description of the object by the primary author. In these cases and where a particular find is discussed by a contributor who is not the principal author of the report (for example, William Manning on the locks in metal finds) the second contributor's name appears in brackets at the end of the additional note.

The objective, in the case of the finds reports, is not to include detailed discussion of particular types of find. However, where there exist local catalogues – which may not be known by a reader unfamiliar with the Balkans – these works are cited when appropriate. Each find record includes the date of the context and the circumstances of deposition.

Nevertheless, these reports do not pretend to represent an exhaustive account of the object's significance and distribution across the Empire. Rather they fulfil the more modest aim of presenting the evidence in a concise format, as a resource for further study by specialists seeking information about the character and range of finds from this ancient city and this part of the Roman and early Byzantine Empire. Exceptionally, where a category of finds is of direct relevance to the interpretation of the site, this is noted and cross-references are made to the excavation report (Poulter 1995).

In the archaeobiological sections, sufficient data is included to allow the reader to consider the evidence upon which the essential conclusions are based. However, for those who wish to gain access to archive records for specialist reports or to consult the full electronic copy of the primary finds records and excavation documentation, this information can be obtained from Archaeological Data Service (Arts and Humanities Data Service) at info@ads.ahds.ac.uk.

All illustrations and catalogued objects are numbered in sequence within each report, prefixed by the appropriate chapter number. For example, following the introduction, the first report, the metal-work, has figure and catalogue numbers prefixed by the number 2 (*eg*, Fig 2.7, catalogue number 2.42). For the finds reports, the description of objects follows the same order. The simple description or name of the object is on the first line alongside the catalogue number (omitted only if a group of objects is listed by type, cf, straight shafted bone pins). There follows the description, material (if appropriate), measurements (mm), then its small-find number (SF), the area from which it came, its context number, the context description and then the date of that context. Where a find is unstratified (u/s) this is noted.

Occasionally, an object comes from an ‘undated’ context: a context which belonged to a short string in the matrix which provided insufficient evidence for it to be assigned with confidence to a single period. In the case of the metal-work report, all but a few finds (listed in the introduction) are illustrated so there was no need to identify which finds in the catalogue are drawn. In all other finds reports, however, all illustrated finds have a star symbol (*) immediately after the catalogue number.

In the archaeobiological reports, numbers on their own within round brackets are context numbers. Where the excavation area is not indicated in the text, it is included within the brackets immediately before the context number.

The illustrations of small-finds vary slightly in style. Although the Director was responsible for the overall guidance of illustrators, many of the final publication drawings were completed during the 1980’s and early 90’s, others later during preparations for final publication and by different illustrators. Consequently, styles inevitably vary although the general principle of producing realistic, rather than schematic drawings, has been invariably applied.



Fig 1.1 Plan of Nicopolis (AGP)

1

INTRODUCTION

by

Andrew Poulter

The Aims of the Excavations at Nicopolis

The primary objective of the joint Anglo-Bulgarian research programme (1985–92) was to examine the character of a well-preserved Roman city in Bulgaria: to identify how it changed and developed from its origin as a Trajanic foundation (established *c* AD 109) through the Roman, late Roman and early Byzantine periods down to its final destruction and abandonment in the late 6th century AD (Fig 1.1 and 1.2). Whereas the Bulgarians continued excavations within the Roman city, the British team investigated the smaller fortified enclosure of 5.6 ha, immediately to the south, which had been identified as the site of Nicopolis in Late Antiquity (Poulter 1983, 90–97), built after the original Roman city had been abandoned (Fig 1.3). It was anticipated that a combined programme of geophysical research and area excavation would offer a unique opportunity to explore the physical layout of the city in the late Roman period. Few sites exist for such an extensive study of late Roman urbanism, either because the remains have been extensively robbed or else because the Late Roman city overlies its Roman predecessor, making it difficult to disentangle the general character of the site in just the late Roman period. Nicopolis, with its two separate sites, one Roman and the other late Roman, appeared not to have been significantly affected by later occupation. Research therefore offered every prospect of uncovering the character of this particular city which would serve as a case study to be compared with other, generally less well understood cities of Late Antiquity. The traditional view for the Balkans, and for the Eastern Empire as a whole, has been that there was no fundamental change in the organization and character of ancient cities down to the 6th century and that it was only after a last period of prosperity 'in the Age of Justinian' that the basis of urbanism was fatally weakened and finally extinguished, first by the Slav and Avar invasions in the northern Balkans and then, in the Near East, by the arrival of the Arabs in the 7th century. It has been the results from Nicopolis and the reinterpretation of the evidence emerging for other cities within the early Byzantine Empire that this view has been modified to reveal a much more complex picture with striking regional variations but also a more general and radical decline in the traditional nature of classical urbanism from the onset of the late Roman period (Liebeshuetz 2001). Even before the excavations at Nicopolis begun, there were indications, in the Balkans at least, that the cities had abandoned their classical form at a much earlier date. The only cities which appeared to still offer some of the amenities and private investment characteristic of urban life in the Roman period were centres of imperial administration where these signs of modest recovery were probably a response to imperial investment for the benefit of the new provincial administration, rather than representing a local revival of civic prosperity (Poulter 1992).

Although the physical development of the city was of importance and might provide clues as to functional continuity or change, the excavations were planned from the outset to include a large scale programme of archaeobiological analysis, aimed at providing evidence for the economy of the city, especially its role in the exploitation of its rich agricultural hinterland. Also, because there exist few sites in the Balkans which have produced a full and reliably dated sequence of occupation, a second objective was to reconstruct a largely site-based ceramic chronology, using coins, imported fine-ware and amphorae, but not relying upon other published corpora from the region. Although this potentially produces a more robust sequence, as well as more reliable dating for finds and biological evidence, it

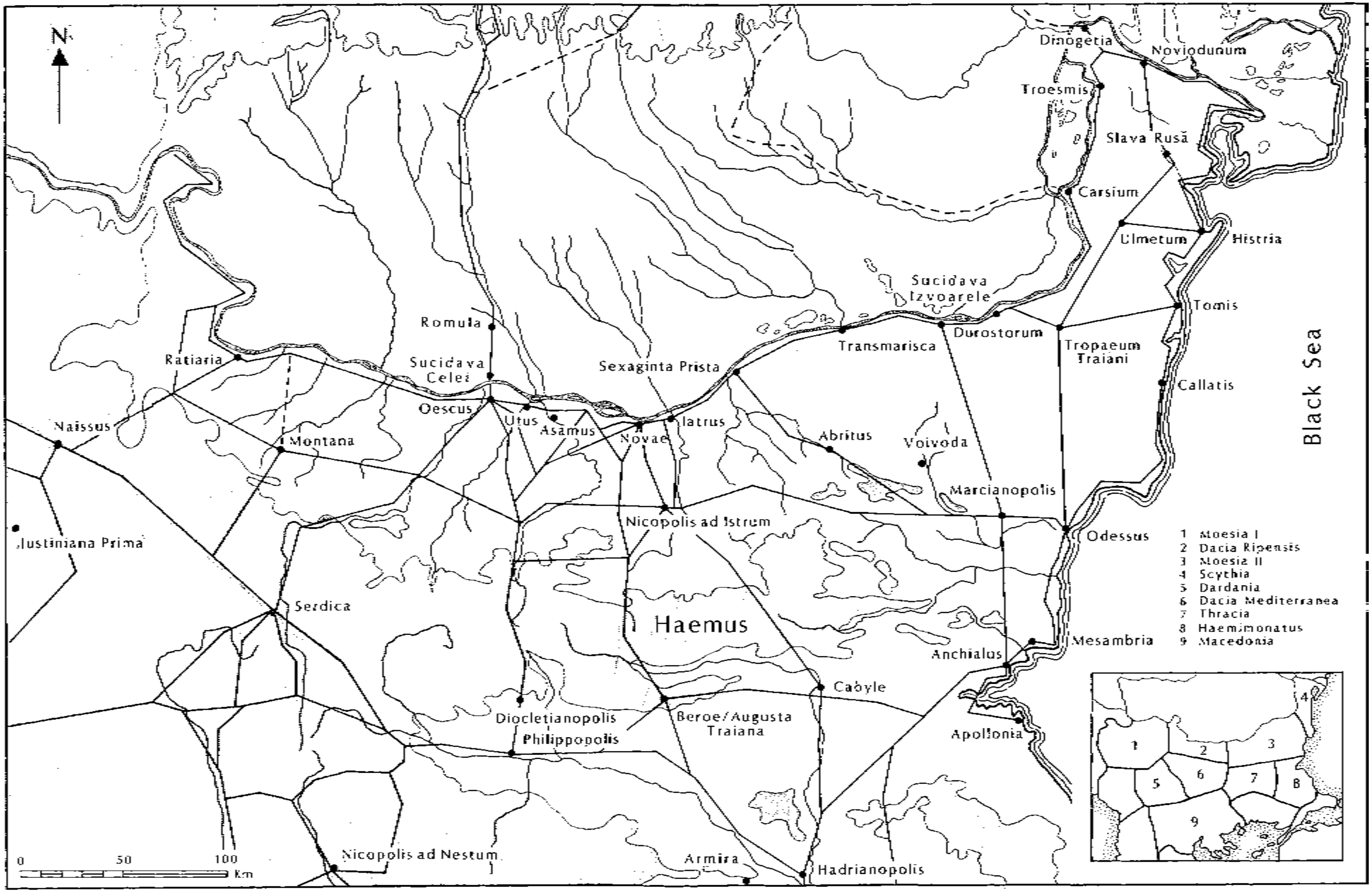


Fig 1.2 The Lower Danube in the Roman period

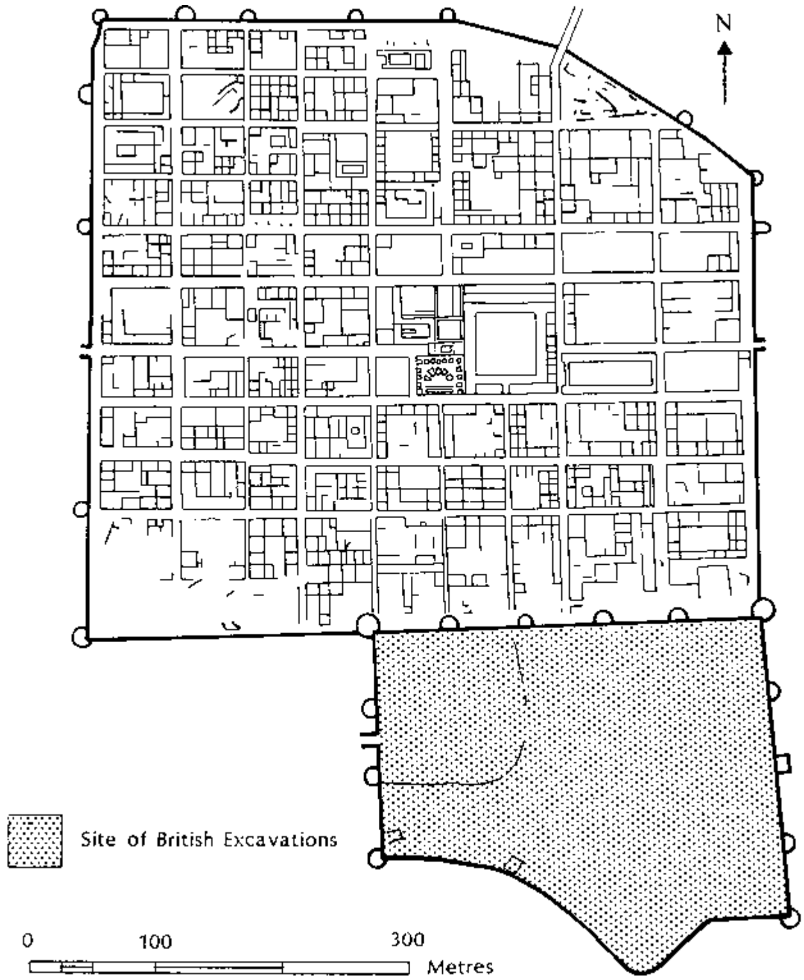


Fig 1.3 The site of the British excavations

is an approach which is not without its own drawbacks, as will be described below (pp. 4–5). Circumstances also conspired to significantly widen the scope of the enquiry. The original agreement presupposed that our Bulgarian colleagues would be working on the Roman site and that the British excavations would be confined to the late Roman to early Byzantine periods. However, within the British sector, well-preserved Roman and late Roman levels were encountered and this allowed the British programme to be expanded to include a study of the Roman city from its foundation down to its eventual destruction in the late 6th century. At the other extreme, because it was discovered that the site had been reoccupied, if sparsely, in the ninth to tenth centuries, and extensively in the eighteenth to early nineteenth, the research was further extended to include both the early medieval and post-medieval periods.

The Publication of the Excavations

The results of the first three years of excavation were published as an interim report in the Antiquaries Journal (Poulter 1988). Field-work was completed in 1992 and research commenced on the analysis of the results of the excavations, the finds and archaeobiological evidence. The task was made easier because the recording, analysis and drawing of the finds to publication standard had continued during each field season and was largely completed by the final year in Bulgaria. All specialist reports were available in first draft before the excavations, geophysics, inscriptions, coins and wall-plaster were published in the first monograph (Poulter 1995). Preparations then continued for the second volume

which contained the pottery report by Falkner and the analysis of the glass finds by Shepherd (Poulter 1999). Since then, the original finds and archaeobiological reports have been revised and, in some cases, radically rewritten for publication in this volume although the general conclusions, summarized in the excavation report, remain essentially the same as those presented here.

Producing three separate volumes over a decade is not an ideal method of publishing a major excavation. The Society for the Promotion of Roman Studies published the first volume on the excavations (with substantial financial assistance from the excavation fund) but declined to continue its support. I and my team are therefore much indebted to the Society of Antiquaries of London for taking on the task of publishing the second monograph and now overseeing the publication of the final volume. In part, this explains the long delay in completing the task. It also accounts for the fact that there is a difference in format between the three books. Nevertheless, we hope that this does not unduly detract from the value of the material which is now all finally available in print.

Dating

It was recognized at the start of the excavation that, because there was no agreement as to the exact dating of ceramics and finds from the region, it was safer to construct and to rely upon a site-based chronology. The method and its more obvious disadvantages have been described (Poulter 1999, 6–7). The most significant of the problems are those presented by residuality which, as on all urban sites, proved to be high. In the case of the pottery, it was clear that in post-medieval contexts, as much as 95% of the ceramic assemblage was residual. Only for the very earliest period in the history of the site, was residuality of negligible significance. Recent work at Dichin has confirmed that residuality at Nicopolis has artificially extended the life of the local fine wares which, though they occur in early Byzantine contexts in the city, we can now demonstrate ceased production before the end of the 4th century. Clearly, in the case of small-finds, the terminal context date provides only a *terminus ante quem* for the use and manufacture of the object. Even so, the nature of the context should indicate whether there is a high or low probability that the find is residual. For example, a pit-fill may include objects of earlier date than the digging of the pit but finds from a destruction deposit, as in the case of the destruction of the Roman city *c* 450, are likely to have been in use at that time.

Despite these caveats, the provision of dating for all the small-finds is here considered of importance for researchers in the region as well as those interested in the dating of finds which occur broadly across the Roman Empire. In a few cases the date of the contexts can be relatively precise (as above, *c* 450). More often, a date range can be provided, based upon the associated finds from that context and its stratigraphic position within the sequence (*eg*, 300–350). All the dates listed are taken directly from final matrices, drawn up by the director for each area of the site and checked against associated material, notably coins and the final ceramic chronology.

The quantitative Assessment of the Data by Period

The essential breakdown of the history of the site falls into five distinct periods; Roman *c* 110–296, late Roman *c* 296–450, early Byzantine *c* 450–600, Slav *c* 800–1000, post-medieval *c* 1750–1850. For the most part, this chronology provides the framework into which the sequence can be most appropriately described. However, the reader should also be aware of the nature of the excavations and how this can affect – and may possibly distort – the validity of the results described below. The most obvious is the accuracy of the site dating: a problem deserving particular explanation and is discussed below. The other, less obvious, but equally important qualification concerns the relative representation of data in each of the periods. True, the quantities of bones, seeds and finds constitute major corpora but they are not evenly distributed. The Roman period was only examined in restricted areas in the centre of the site and along the northern defences. However, the late Roman period was by far the best represented period with deep, well-stratified deposits from all excavation areas except for area E. Although the early Byzantine period was well-understood in terms of buildings, there were

relatively few areas which produced good occupation surfaces, partly because many of the structures were unlikely to have acquired domestic debris (the churches in areas F and K) and partly because the deposits were close to the surface and often contaminated or disturbed (area M). An additional complication is the failure of the excavations to identify major areas of intensive domestic occupation in this period – although, this probably accurately reflects the nature of the site at that time. For the Slav period, pottery indicated occupation close to area K, but only one building was found and excavated (area F). The evidence from the post-medieval period was abundant. Inevitably, this bias in the availability of data by period must be taken into account when judging the significance of the results. For example, Boev argues that the most extensive range of birds belongs to the late Roman period. This is true. What is less certain is whether this is significant in terms of the importance of, say, domestic fowl in the 4th century AD or whether it simply reflects the obvious fact that he had more material available for study from this period than from any other. The problem is of direct relevance to any attempts to accept, at face value, the conclusions based on the quantification of data, a difficulty that is rarely stated explicitly though it applies as much to Nicopolis as it does to any major excavation (Poulter 1999, 28–9).

The Excavations (Fig 1.4)

Excavations took place in fourteen areas (A, B, C, D, E, F, H, K, L, M, N, P, R, S).

High banks of spoil followed the line of the tower walls and curtain but only the occasional irregular hole indicated spasmodic robbing across the interior of the site. Consequently, it was anticipated that a resistivity survey over the full extent of the interior would guide the choice of areas for excavation. Because the early Byzantine level survived just below the modern ground surface, the survey proved remarkably successful and did locate structures and provided a clear distribution of buildings across the site, the majority of which were of early Byzantine date: earlier Roman and late Roman structures, even when surviving as upstanding walls, were so deeply buried that their existence was masked by the early Byzantine occupation level. Only in the case of the paved Roman road coming out from the south gate, did a prominent early feature appear clearly in the geophysical survey (Strange in Poulter 1995, 259–267). Despite the fact that internal floors remained mostly intact, the robbing of mortared structures in the post-medieval period had been so extensive that the walls of major buildings, such as the two basilicas (areas F and K), had been reduced to their lower foundations. However, earlier structures, built of stone with earth bonding, survived remarkably well. None must have been visible on the surface, even where the walls survived almost to the modern turf line (especially D and K). The post-medieval settlement was extensive and five of the excavation areas produced buildings of this date but the structures were flimsy and consequently rarely appeared in the geophysical survey.

Although, in the central area, all excavation areas were selected to investigate positive anomalies visible in the resistivity survey, the mounds of spoil, immediately inside the line of the defences, masked all buried features. Here, the selection of sites was dictated by upstanding visible remains or by the negative plan of structures which had been robbed, notably the sites of towers and the east gate. All were, from the outset, area excavations except for H, K, L, M and N. These cuttings examined the stratigraphy at key points across the site. All were recorded in plan and section but were not subsequently extended, apart from K and M which were enlarged into full area excavations. None of the cuttings were carried down below the early Byzantine occupation level so neither the extent nor the character of earlier occupation is known for these sites.

Area A was an area excavation, located where it was anticipated that the south gate of the Roman city would be found, at the end of the *cardo* running along the east side of the agora and which terminated at its northern end with a well-preserved town gate. This presumption proved to be mistaken: the south gate was found further west (area C). Instead, finds included an early Roman house, destroyed by fire in the late 2nd century, the berm of the city defences immediately south of the wall (here robbed to its lowest foundations) and the Roman defensive ditch, replaced in the early

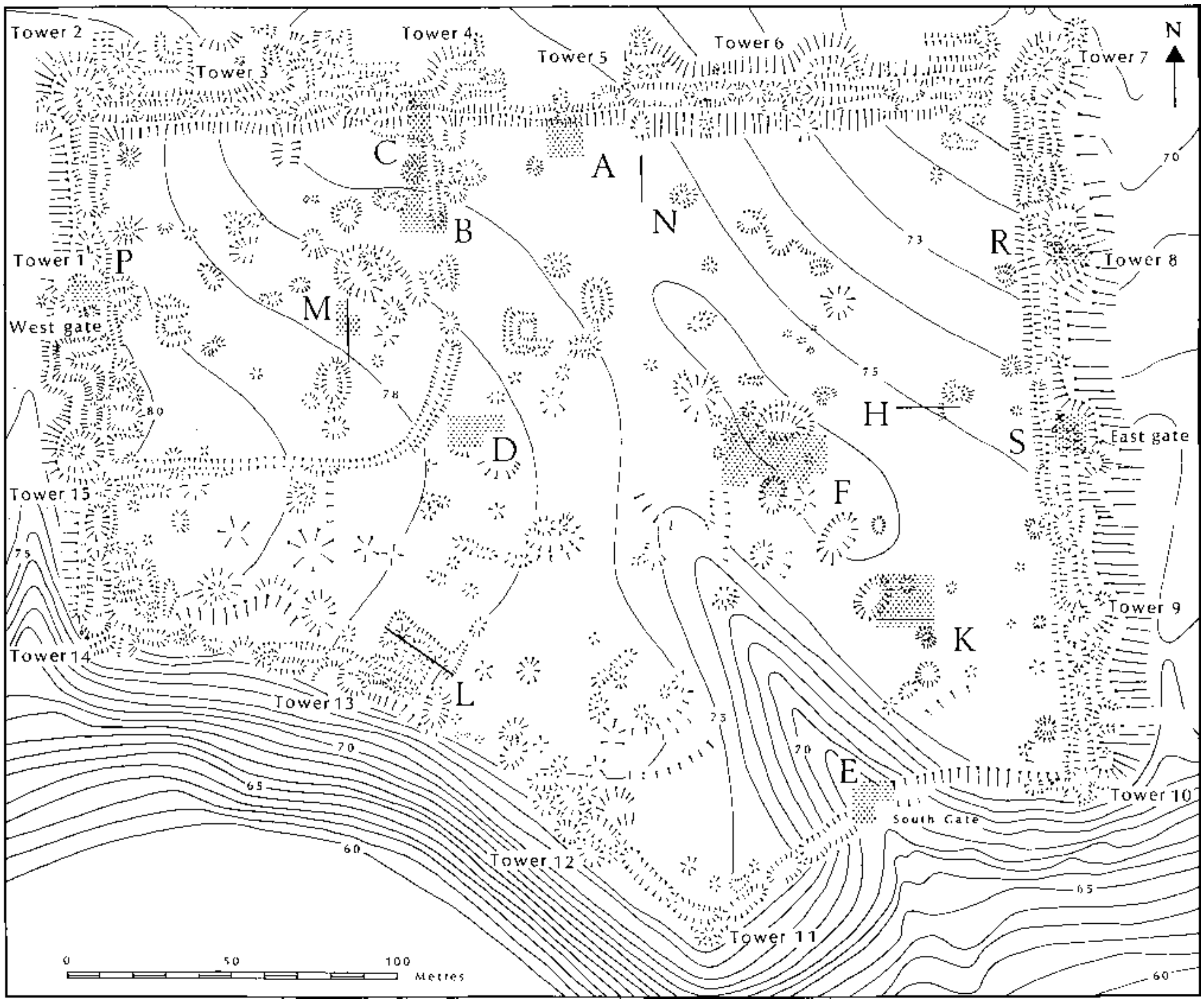


Fig 1.4 The early Byzantine city and the excavation areas

5th century by a larger ditch and an outwork or *proteichisma* on the edge of the berm which had been destroyed by fire, then collapsed into the ditch when the city was destroyed *c* 450. After the subsequent backfilling of the ditch (largely with spoil and destruction debris from the latest levels within the abandoned city), the only evidence for occupation in the area during the 6th century was a hearth and one side of a building preserved in the east section and extending further east.

Area B was positioned to intersect both the strong north/south positive anomaly which turned out to be the paved surface of a Roman road, partly dismantled in the 3rd century and then repaired with an extensive cobble surface, used for the slaughtering of cattle and industrial activity during the 4th to early 5th centuries. Apart from isolated finds in the subsoil, there was no sign of occupation in the 6th century or in the post-medieval period.

Area C investigated a number of large stone blocks which survived above ground and which appeared to be *in situ*. These proved to be the remains of a well-preserved Roman gate. The area was subsequently extended south to join with area B. Some slight traces of early 2nd century occupation were found as well as the massive, central slabs of a mid 2nd century Roman road which continued in use after the construction of the defences *c* 175. During the 3rd century, road slabs were removed and the defensive ditch was extended across in front of the gate, presumably to increase security for the city. Since the gate was no longer in use, it was probably blocked. During the 4th century, the road across the ditch

was reinstated and repaired with a cobbled surface. A guard-chamber was added to the outside of the Roman gate-tower. As in area B, this surface produced numerous finds of iron and copper-alloy, including coins, perhaps because this area, was used for commercial transactions. Clear evidence for the destruction of *c* 450 covered the inside of the gate and lay across the roadway. With the early Byzantine reconstruction of the site, the gate was blocked, the curtain-wall thickened and a tower was attached the outer face of the new defences. A single building was identified, built up against the inside of the curtain-wall. Following a subsequent destruction, towards the end of the 6th century, the area was abandoned until its reoccupation in the post-medieval period when a roughly cobbled surface continued south of the gate and another building, like its early Byzantine predecessor, abutted the inside face of the curtain-wall which consequently must have been still standing in the late 18th century.

Area D produced the earliest evidence for occupation, dating to the early 2nd century, following the clearance of tree cover, no doubt carried out when the city was first founded. During the late Roman period, a structure with a tiled roof but walls bonded with earth was erected, probably the back range of a large building extending north of the area. The excavated rooms served as an agricultural store, an area for crop processing and was used for the manufacture of bone tools. The complex was destroyed by fire and the area was subsequently used for the dumping of refuse in pits during the first half of the 5th century. After the early Byzantine reoccupation, there was just one simple earth-bonded building, a two roomed structure, open to the south, perhaps workshops. After its late 6th century destruction, the site was abandoned until the post-medieval period when a house occupied the eastern side of the area. Its life also terminated in destruction by fire.

Area E was selected because a small portion of clearly late Roman wall (with mortared tile courses) was visible before excavation. This turned out to be the top of a very well-preserved early Byzantine gate and a section of curtain-wall. Slight traces of a cobbled surface indicated that the site, as its topographic situation suggests, had provided access down to the river and probably harbour installations. Two periods of occupation were identified along the inside of the early Byzantine wall and significant finds came from the silty primary fill of the large drain constructed beneath the tower gate.

Area F, as the geophysical survey suggested, was the site of a Christian basilica of early Byzantine date, commanding the central and most elevated location within the defences. Beneath, late Roman levels were examined. They included successive buildings and a cobbled road surface of 4th to early 5th century date. Although the interior of the basilica with its tiled floor was well-preserved, robbing had removed most of the wall foundations. The church had been destroyed by fire at the end of the early Byzantine period and was subsequently abandoned although a Slav grubenaus, still with jars full of grain *in situ* on its floor, was found immediately to the north. Evidently, at least in this area, occupation in the 9th–10th centuries had occurred and was terminated abruptly by fire. Two grubenhäuser occupied this site in the post-medieval period.

Cutting H located another early Byzantine building, one which formed part of the line of structures, roughly aligned east/west, which crossed the centre of the enclosure.

Area K was examined by a cutting, followed by area excavation where the resisitivity survey indicated the presence of a building. This proved to have been a small early Byzantine church. Beneath, a late Roman structure was excavated above successive dumps of domestic and industrial waste belonging to the late 3rd to early 4th century AD. Slav pottery suggests medieval occupation in the vicinity and slight remains of several post-medieval houses were found.

Cutting L was made to examine one of the few sizeable structures which had been robbed in recent times and which clearly indicated the presence of a large, roughly square building close to the southern defences. It proved to be of early Byzantine date and appears to have been reused in the post-medieval period.

Area M was first a cutting, positioned to intersect the line of massive buildings, the foundations of which were clearly visible in the geophysical survey. Although no occupation surface survived, the massive earth and stone foundations of the early Byzantine building were identified. Totally unexpected, however, was the discovery that they cut the well-preserved upstanding remains of a Roman house, constructed *c* 200 and destroyed by fire about the middle of the 3rd century. Because the excavation uncovered substantial quantities of frescoes and moulded stucco cornices, only the north-west corner of the house was uncovered, leaving the remainder of the structure undisturbed. Even so, a large main room and two side chambers were excavated and the adjoining section of a central court where one of the columns and its stone column base were found lying where they had fallen when the house was systematically demolished, immediately after its destruction by fire. Subsequently, during the 4th century and probably on into the early 5th, the abandoned area was used for the dumping of domestic waste in pits. After the end of early Byzantine occupation, the area was only subsequently disturbed by more post-medieval houses. As elsewhere, occupation ended with destruction by fire.

Cutting N transected the interior of a building, destroyed by fire and probably of early Byzantine date. This was identified at the southern end of the excavation and no structures were found in the central and northern ends of the cutting.

Area P examined the interior of tower 1, immediately north of the gate on the west side of the early Byzantine defences. Although the walls of the fortifications had been badly robbed, internal stratigaphy survived intact. The earliest occupation surface contained an *in situ* column-base which presumably belonged to a public building, flanking the *cardo* which must have passed immediately to the east of the area, at least until the construction of the city's defences *c* 175. It was covered by a dump of redeposited destruction debris, dating to the late 3rd century. Thereafter, the area was abandoned and perhaps used for cultivation, as is suggested by a deep build-up of organic rich soil. With the early Byzantine reoccupation, the foundations were cut for an externally projecting, rectangular tower. The interior was then backfilled with successive dumps of soil, rich in finds and destruction material, surely barrowed in from the last level within the abandoned Roman city to the north. This was used to level up for a simple clay floor. Two periods of occupation were identified, both early Byzantine in date.

Area R investigated a massive prow-shaped tower (tower 8) on the eastern curtain. The interior was rather more impressive than that in area P: it had a tiled floor beneath which was a levelling deposit of earth and destruction debris, similar in character but lesser in quantity to that used as make-up during the construction of tower 1 (area P). Probable is it that this dump of soil, rich in finds, was also taken from the final occupation level within the Roman city to the north. There was no sign that the tower was reused or that occupation existed in the immediate vicinity after the early Byzantine period.

Area S lay at the mid point along the eastern defences and, as expected, proved to be the main gate on this side of the early Byzantine enclosure. The earliest occupation included the remains of a building destroyed by fire. Its date remains uncertain: it may have burnt down in the 3rd or 4th centuries AD. Thereafter, skeletons suggest that the area formed part of a late Roman cemetery before the defences were built. Large stone blocks, taken from the Roman city, were used in the construction of this tower gate which had two periods of use, both early Byzantine. During the second phase, it probably served only as a tower and the gate was blocked. There was no sign of later occupation although Slav pottery suggested that there had been early medieval settlement close by.

The Results of the Excavation: a Summary

What emerged was a very different and more complex history of the site than had been anticipated. The rapid development of the city in the provision of fine, paved roads and civic amenities during the first half century of its existence was matched by an immediate and rapid economic development: local fine

wares were being produced to supply the city's needs before *c* 130 and the exploitation of the fertile territory was soon underway, resulting in the provision of a wide range of agricultural goods (Fig 1.5). Native involvement in the city's affairs would seem to have been limited: only in the very early years was local Thracian pottery in use and then only in small quantities, before being completely supplanted by Roman wares. In the city's inscriptions there is equally no suggestion that natives were involved in civic administration, at least not until the Severan period. The majority of the citizens, artisans and craftsmen, as well as high ranking members of the city elite, came from Asia Minor and, in particular, from the two cities of Nicaea and Nicomedia. Nicopolis, rather than representing a native community which gained civic status, would seem to have been an artificial creation, attracting immigrants, especially from western Asia Minor. To what extent this was a spontaneous initiative or whether it was part of an official policy to foster urban growth in the hinterland of the Danubian frontier, now partly demilitarized after the conquest of Dacia, remains uncertain. Nevertheless, the city's growth is attested by further, if still sporadic, development across the plateau, including agricultural buildings and some civic structures.

That the peaceful development of the city was abruptly, perhaps violently interrupted, is suggested by the excavation of a fine town house, destroyed by fire and then immediately buried in the berm inside a defensive ditch which was dug at the same time as the urban defences were erected *c* 175. Quite possibly Nicopolis was sacked by the Costobocci in 170 when they crossed the Danube and inflicted devastation upon the open settlements of Thrace and Greece. The city walls, built of large limestone blocks and some reused architectural fragments, formed part of a general programme of refortification in the 170's and 180's, protecting for the first time the urban centres of Moesia and Thrace, a measure carried out under imperial orders and probably with military assistance.

The effects of the barbarian invasion were short-lived. Although the defences were maintained, urban development resumed outside the walls. Indeed, an extramural quarter, by *c* 200, included well-appointed town houses, one of which was excavated (area M). This contained rooms decorated with frescoes, including architectural scenes of some pretension and fine moulded stucco freezes. This, to judge from the building inscriptions and the number of statue bases erected in the agora, was a still more prosperous period than the 2nd century, a picture reflected in the range of agricultural supplies available in the city. It did not last. Before the middle of the 3rd century, the fine extramural town house had been abandoned by its occupants and the rooms were used for agricultural and industrial purposes: what must have been fine marble floors were removed and replaced by simple clay surfaces and rough stone steps. Finally, the house burnt down and, after its tiled roof had collapsed across the floor and the marble colonnade in the courtyard had fallen down, the remains were systematically demolished and the site levelled. For the next quarter century, the region suffered from the Gothic invasions and the city was probably besieged by Goths on at least two occasions. Perhaps, the demolition of the extramural houses was a measure taken by the citizens themselves to deny cover to an enemy in the event of an attack. Certainly, the south gate (area C) was blocked and the defensive ditch was extended, cutting through the roadway which had previously provided the only means of access to the city on the south side of the fortifications. The extramural area would seem to have been abandoned until the closing years of the 3rd century when the frontier was restored during the reign of the emperor Diocletian.

The fate of Nicopolis in the 4th century is of especial interest since the intramural situation was very different in character from that existing on the plateau to the south of the city walls. Thanks to intensive robbing of upstanding walls of buildings in the 18th to early 19th centuries AD, it proved possible to draw up a remarkably full plan of the city as it must have appeared in the last years of its existence, in the late 4th to early 5th century AD (Fig 1.1). It seems that, apart from the obviously civic development in the centre of the city, and probably also in the northern *insulae*, there is remarkably little sign of modest housing. Some small, two-roomed buildings along main streets may well have been shops but the most striking feature of the city plan, especially the outer *insulae*, is the existence of town houses. These well-built structures of brick and mortar are conspicuously large although, in number, they would appear to represent residences for only some thirty to forty families. This suggests a very small intramural population of several hundred, mostly members of the elite with their dependants but

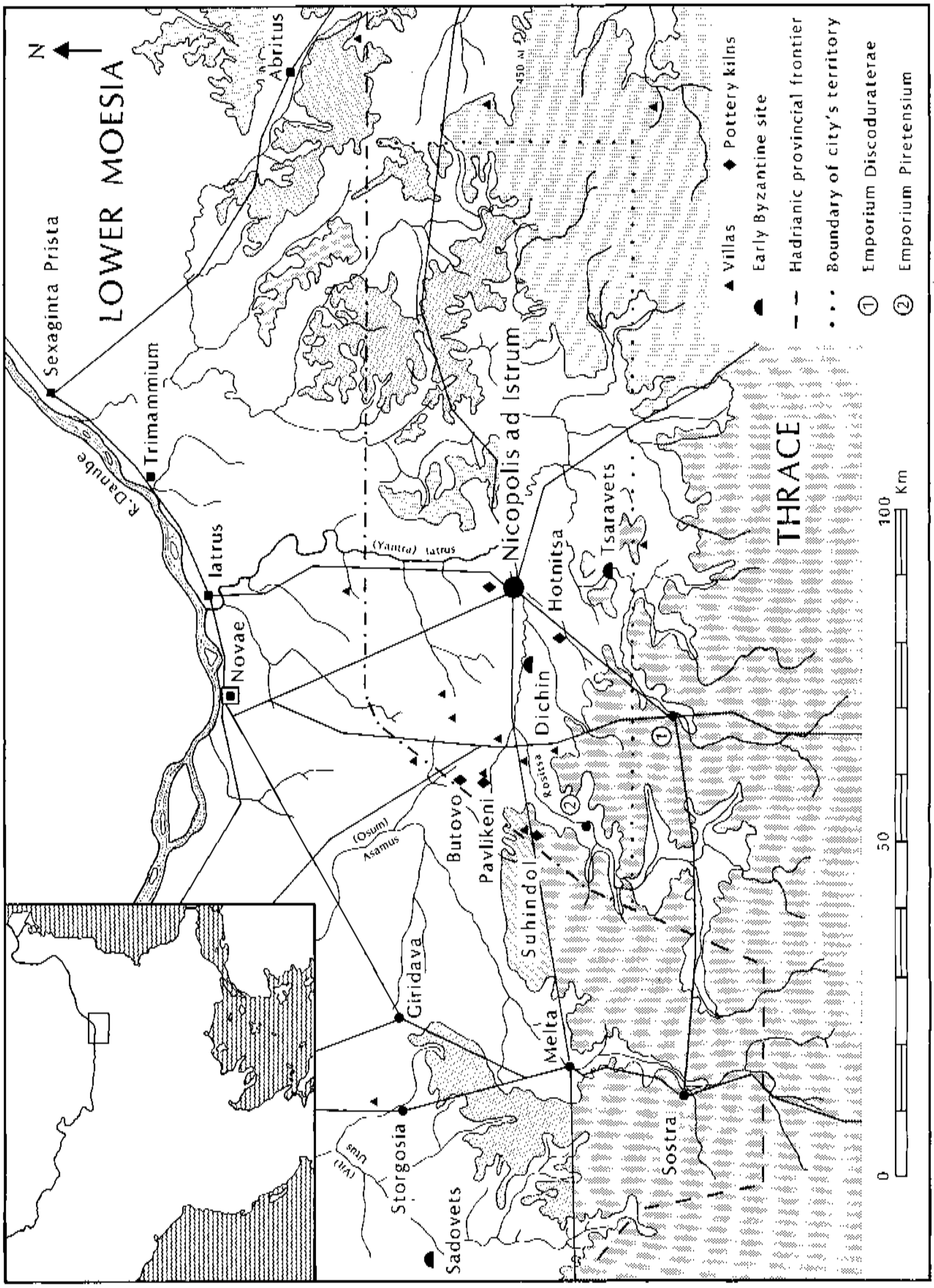


Fig 1.5 Nicopolis and its territory

certainly not thousands. On the other hand, some of the finds, including the glass, suggest that there was still wealth in the city, at least in the hands of some of those who were privileged to own a substantial dwelling. The variety of agricultural produce reaching Nicopolis in this period appears greater than ever before and there is no hint either, in animal husbandry, that Nicopolis was in any way short of money. Still, the preservation of the same primitive Roman fortifications is some indication that the city was no longer the important centre it had been in the Severan period. Many other contemporary communities, such as Tropaeum Traiani, were embellished with large and impressive defences in the early 4th century (Fig 1.2). The fact that it was not a city used by the imperial administration as a provincial capital may well be the reason: there was no additional source of imperial funding to pay for new defences and the construction of new public buildings (Poulter 1992).

The extramural area was quite different. It was a hive of activity. Immediately south of the defences, the area was kept free of buildings, not doubt to maintain a free-fire zone within bowshot of the walls. But even here, the open space was used for industrial purposes, metal-working and the slaughter of cattle, apparently brought to the city on the hoof. The substantial number of 4th to early 5th century coins from the cobbled area outside the gate also suggests that it may have served as a market. Further south, there were large buildings (D and F), some serving as accommodation, others as agricultural buildings and workshops. Small cobbled streets criss-crossed the plateau. It would seem that there existed a substantial community, certainly on the south side of the city. But it differed from the houses within the city in that these were made simply of stone, bonded with earth and not with mortar and brick – although they did have tiled roofs. So, although the extramural area would seem to have been occupied by a large number of people, they would appear to have been of a lower status and could not aspire to the quality of the housing provided for those fortunate enough to reside within the city walls. In metal-work and other finds, this settlement was no different from what one would expect of any Roman site in the region in the late Roman period. However, one perhaps significant development was the appearance, from the middle of the 4th century, of new types of pottery similar to that produced by the Sîntana-de-Mureş/Chernyachov Culture beyond the Danube. In some cases, the forms are traditional and Roman but others are new and unparalleled in earlier Roman assemblages. In either case these black wares with their characteristic burnished decoration are new to the region and have been linked with the arrival of the Goths (Falkner in Poulter 1999, 111–112). This would not be an improbable explanation. In 347/8 Constantius II permitted Ulfila and his Gothic followers to cross the Danube and they were settled in Nicopolis' territory. That some should be attracted to Nicopolis and settle outside the city would not be at all surprising. Moreover, the use of massive walls, but built of stone, bonded only with earth, is not a building style which existed in the region in the 2nd or 3rd centuries and it is tempting to suggest that this change in construction technique, especially for domestic buildings, and which becomes dominant in the 4th to 5th centuries, was introduced by new immigrants.

By the late 4th century, this extramural settlement had declined and perhaps had been totally abandoned. At least one building (area D) was burnt to the ground and never rebuilt. Part of the plateau (area S) may well have been used as an extramural cemetery. This retreat, perhaps behind the security of the fortifications, may well have occurred during the turbulent years immediately proceeding and following the revolt of the Goths which culminated in the death of the emperor Valens and the destruction of his army at the battle of Adrianople in 378.

There is no sign of any revival in the city's fortunes during the first half of the 5th century. On the contrary, the extramural area would seem to have been totally abandoned and the only activity was concentrated on the defences. The defensive ditch was widened and deepened while a second line of defence, a mudbrick outwork (*proteichisma*), was constructed outside the main walls: measures taken to strengthen the defences. About the middle of the 5th century, the city was destroyed by fire. A date *c* 450 is most likely and it would seem probable that the destruction of Nicopolis was carried out by the Huns. No attempt was made to restore the Roman defences and the city was abandoned.

How long the site was left derelict it is impossible to say. It may have been only a few years. A reoccupation during the reign of Marcian is the earliest historical context but it could have been later

in the 5th century. Certainly, Nicopolis was rebuilt and reoccupied by the beginning of the 6th century. The new fortifications were located south of the city, reusing the eastern portion of the old south wall as its northern side and extending south so that its opposing wall could command the steep river cliff, overlooking the river Rositsa (Fig 1.1). When compared with the now abandoned Roman city (25ha), the new site of 5.7ha would seem small but it nevertheless required impressive new defences.

The interior was surprisingly open and lacked the organized layout characteristic of early Roman cities and of Nicopolis itself. Indeed, there was hardly any sign of roads at all. Only at the east gate, was a cobbled surface identified (area S). A range of buildings crossed the centre of the site, almost certainly two stories in height, perhaps barracks or storebuildings. A main basilica occupied the highest point in the centre of the enclosure (area F) and a second, smaller church (area K) existed towards the south-eastern corner. In the middle of the site there was a small open-ended, two-roomed building, possibly workshops but with no other structures in the immediate vicinity. Especially on the northern side, there were very few buildings but instead large open areas. The economy also appears to have changed. There was little evidence for the large-scale cultivation of crops such as wheat, so characteristic of the Roman and even the late Roman period. Instead, Spring grown crops and pulses appear more important, suggesting a greater dependence upon a 'market garden' form of farming, producing food which could be grown close to or even within the defences. The increasing importance of pork over beef may also be explained by the need to keep animals that could be quickly and easily brought within the protection of the defences. Instead of relying upon its own territory, there is a notable rise in the proportions of imported amphorae from North Africa and the Aegean. But the most surprising feature of this 'city' was that it contained, apparently, so few people. It was no longer a centre of civilian population; there is more evidence for the existence of settlement outside, within the ruins of the Roman city. In general terms, it seems that the city acted as an ecclesiastical and probably military centre, almost certainly maintained by central authority and no longer, as in the past, supported by the exploitation of its rich agricultural hinterland.

Occupation ended with destruction by fire, perhaps as early as the 580's, although Nicopolis is recorded for the last time in 598 during the last major campaign waged by Byzantine forces in the region. The end of the city may not have been violent. There are suggestions that the main basilica (Area F) and the roof of at least one tower (area P) had been systematically dismantled before the site was set on fire and abandoned. Thereafter, there is no evidence of renewed occupation until the medieval period when the site was occupied in the 9th or 10th century by a small community. The next and final period of occupation dates to the 18th to early 19th century when the ancient site would seem to have been on the edge of a substantial post-medieval settlement which, in its turn, was burnt to the ground and hastily abandoned; the numerous finds of military equipment, including grenades and cannon-balls, indicate that this event involved a violent assault. Thereafter, the only activity attested is the extensive robbing of buildings and even the foundations of the curtain-wall and towers which had been completed before the site of Nicopolis was first identified by Felix Kanitz in 1871.

The Transition to Late Antiquity programme (1996–2005)

One of the most striking results of the excavations at Nicopolis was the dramatic change in the nature of the site, in its physical character and apparently in its economic base during the early Byzantine period. Far from remaining essentially unchanged for the five hundred years of its existence, the city of the 6th century was clearly very different, not just in appearance, but also in function from the Roman city it replaced in the 5th century. But the excavations could offer no explanation as to why this should have occurred. Clearly, one possibility was that it followed a catastrophic collapse of the regional economy, evidently based in the Roman period on the exploitation of its rich agricultural hinterland. Alternatively, it was possible that the reasons for this change were more general, perhaps promoted by central imperial policy. In which case, the changes at Nicopolis might be an indicator of change in the nature of cities in the 6th century and applicable more widely to the Byzantine Empire. It seemed that the best and most practical way of approaching this question was to explore the character of the

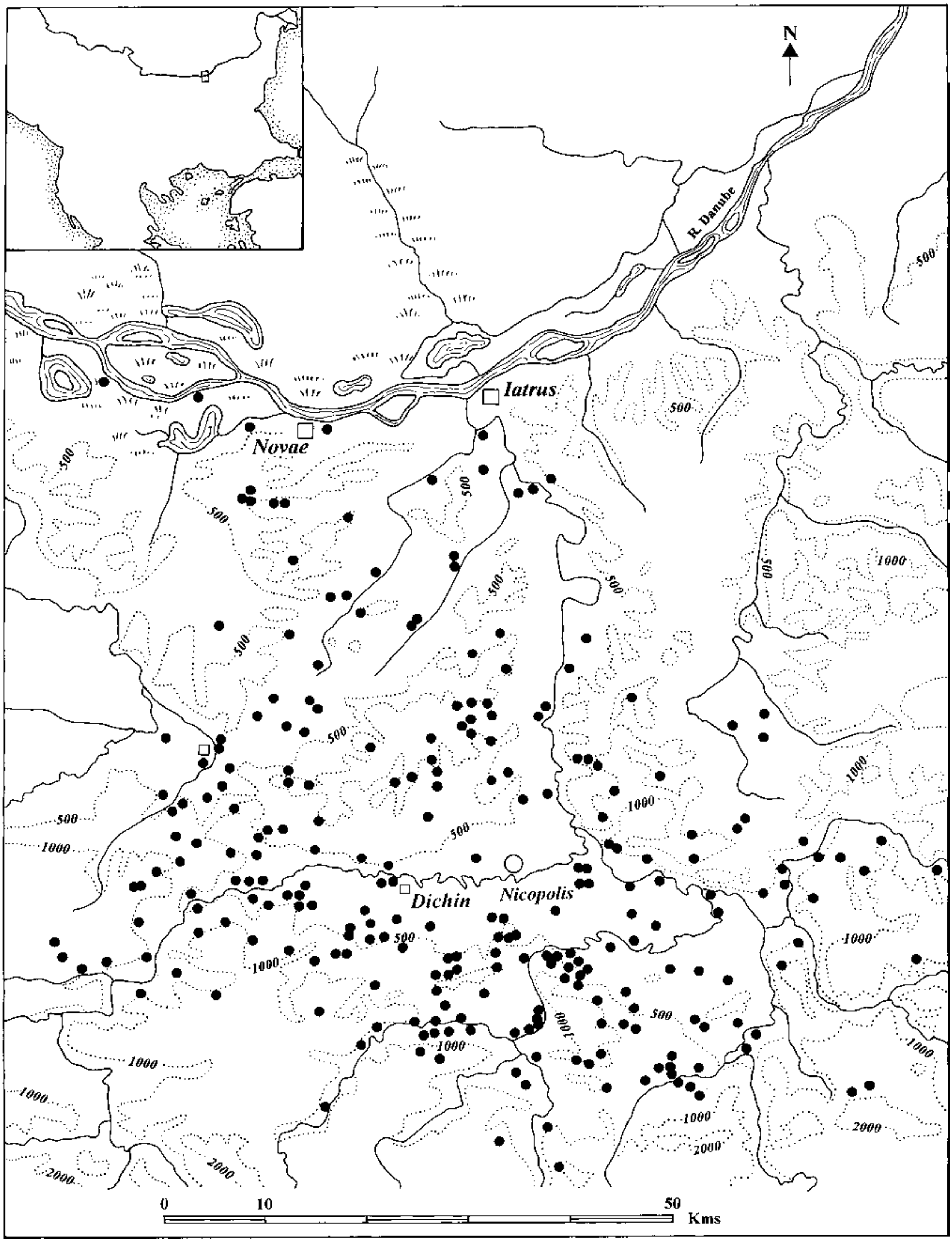


Fig 1.6 The survey region

landscape around the city and to try and ascertain if there had been a change in the economy or settlement pattern which could explain the demise of the classical city of Nicopolis in the 5th century. If, however, no such temporal connection could be found then it would seem more plausible that the explanation was not regional but of more general significance for the Eastern Roman Empire.

Consequently, the second Anglo-Bulgarian research programme (The Transition to Late Antiquity), 1996–2005) was set up to answer this major question posed by the excavations at Nicopolis. It involved two distinct but related projects.

The first was to explore a sample area of 2,000 square kilometres, extending from the Danube (the late Roman and early Byzantine frontier) south as far as the Stara Planina (*Haemus mons*) in north central Bulgaria (Fig 1.6). This involved developing a new method of site-specific survey which examined a selection of thirty-five sites within the survey region, chosen from the 500 known Roman to early Byzantine settlements identified by members of the Veliko Turnovo Museum, lead by Mr Ivan Tsurov. The aim was to explore the character of these sites, to identify their function and date. As they had all been identified by non-intensive survey methods, it seemed likely that the majority would belong to the upper levels in the settlement hierarchy. This proved to be so: all but one can be confidently identified as having been Roman villas. The fact that smaller settlements were excluded does not prejudice the results of the fieldwork. Since the fate of the city rested upon the success or otherwise of the wealthy landowning class, it was sufficient for the aims of the project to concentrate on this category of site. If there was any radical dislocation of the villa economy in the late 4th or 5th century then that could account for the radical down-turn in Nicopolis' fortunes, evident from the excavations of the first programme.

The second element was to be the excavation of a typical 'village' in the countryside, some 15km west of ancient Nicopolis. The primary aim of the excavation was to provide good zooarchaeological and archaeobotanical evidence for the late Roman and early Byzantine periods and in this the project was remarkably successful. The site selected, Dichin, proved to have been built *c* 400, and to have suffered its first destruction *c* 485. It was then rebuilt but finally destroyed and abandoned *c* 585. The two destruction levels, and in particular the first, produced a considerable quantity of archaeobotanical material, recovered from granaries and buildings which had been destroyed by fire. What was not expected was that the site proved not to have been a humble village but an impressive stronghold with well-built defences. From the finds, it seems to have contained in the 5th century a community of soldier/farmers and storage facilities for local agricultural produce.

Now that this programme has terminated, some provisional conclusions have been published. An interim report (Poulter 1999) has been followed by reviews of the implications of the programme (Poulter 1999a, 1999b, 2002). Particularly important is the new archaeobotanical evidence (Dr P. Grinter), the archaeozoology (A. Hammon, C. Johnstone and R. Parks) and the ceramic analysis (Dr V. Swan). These results from Dichin will be of singular importance for placing the results at Nicopolis in a broader economic context. The process of post-excavation analysis is well advanced and the results should soon be available in print.

2

THE METALWORK

by

Andrew Poulter

Two thousand three hundred and sixteen metal finds were catalogued. Without exception, all were cleaned and conserved in the Historical Museum of Veliko Turnovo. I owe a particular debt of gratitude to the staff of the conservation laboratory for their painstaking and full treatment of the metal objects, no matter how small or unpromising their condition. It is thanks to their work that many objects, which otherwise might have been overlooked, were identified and preserved; notable, for example, was a ‘wedge of corrosion’ which proved to be a well-preserved section of chain-mail (2.183). I am also grateful to Dr L. Allason-Jones for her help with particular copper-alloy finds and her advice on the presentation of this report as well as to Professor William Manning for checking the identification of iron objects and for providing a description and interpretation of the two locks (2.181 and 2.182).

The bulk of the catalogue includes finds which are described as individual items. The material has been assigned to broad categories for easy reference although of course none of them are definitive: the choice as to which group a particular find belongs is inevitably subjective. For particular subgroups of finds, the reader should consult the index. Discussion and references to similar finds are kept to a minimum. However, where regional corpora for specific kinds of object exist (which might not be known to the general reader) references are included. Normally, it is only where the find is of intrinsic interest or importance that a fuller discussion is provided. Exceptionally, where finds are relevant to the interpretation of the archaeology (as with the double-spiked loops on the site of the Large Basilica), then a brief explanation is included.

All finds are illustrated except for five poorly preserved objects (2.168, 2.170–1, 2.194, 2.197) and where type examples stand for groups of finds; calkins, horse-shoes and nails.

The Roman metalwork, including the iron, is generally in a very good condition so the quality of preservation in itself is not a reliable way of distinguishing between even a Roman and a post-medieval date; the dry, sandy soil is so porous that the ground does not retain moisture so the effects of corrosion are less than would normally be expected.

Some post-medieval finds merit publication, usually because of their intrinsic interest and relevance to the history of the site, as with the post-medieval militaria. A small section of post-medieval finds is also included because the excavations proved conclusively that they were 18th or 19th century in date even though identical items have been published as medieval. Dated examples of these items (horse-shoes and calkins) are listed and a sample of the forms illustrated.

The penultimate section on nails forms a category on its own since they are best treated as a typology. All nail types, Roman, early Byzantine and post-medieval are described. The report concludes with a description of the copper-alloy and lead waste, the date and distribution of which has implications for our understanding of industrial activity at Nicopolis and the areas where it was concentrated.

Certain contexts were particularly rich in metal small-finds. Metal objects were by no means evenly distributed across the site. Understandably, they appear commonly in destruction levels; of the late 2nd century in area A, of the mid 3rd century in area M, in the burnt remains of the late Roman building in area D, in the vicinity of the Roman gate in area C, in the mid 5th century and in the remains of the post-medieval houses, all of which had been destroyed by fire and apparently abandoned in haste. But there were other contexts that were also conspicuously rich in finds, the significance of which is discussed within the main report and, in the case of scrap, in the final section of this report.

ITEMS OF DRESS AND PERSONAL ADORNMENT

BROOCHES (Figs 2.1 and 2.2)

Roman brooches

2.1 An 'Aucissa' type
The strongly arched and tapering bow is decorated with longitudinal ribs above the short, plain foot. The flat head has three holes and notched edge at its junction with the bow. Typically for this type, the hinge, which retains its axis bar, is formed by curling upwards the end of the head. This widely distributed form is well-known in southern Pannonia; Kovrig 1937, type VII 115–116, cf, Taf. IV 36a, 38, 39 and also in Bulgaria; Gencheva 1987, type II/1, 36–7, cf, fig 3.e–z. In the region, this type is most common during the first half of the 1st century but does occur less frequently in Flavian and early 2nd century contexts; Gencheva 2004, type 13, 37–9. At Nicopolis, it is most unlikely to have been lost before the foundation of the city *c* 110 (Poulter 1995, 10). The pin is missing and the catch-plate broken.
Copper alloy. Length 47mm.
SF 8303, F 3384, backfill of robber-trench, 1750+.

2.2 Hinged disc brooch
This open-work example has a spiral design with trumpet ends. Disk or plate brooches are common during the 2nd and early 3rd centuries; Gencheva 1987, 40–41, type IV. Pin missing.
Copper alloy. Diameter 43mm.
SF 4624, D 665, levelling dump deposit, 250–350.

2.3 Hinged brooch
The chamfered bow is decorated with three transverse ribs. A prominent terminal button and knob project from the end of the foot, above a deep catch-plate. The flat head has a thickened end to take the axis bar, semicircular cuts on both sides, and projecting wings at the junction with the bow which it meets at an oblique angle, creating the characteristic angular profile. The type is common in the region; Gencheva 1987, type I/4, 36 and fig 3g, Gencheva type 8e, here dated to the end of the 3rd to early 4th century, Gencheva 2004, 27.
Copper alloy. Length 38mm.
SF 8077, F 3088, spread of robbing debris, 1750+.

2.4 Brooch fragment
Only the catch-plate, short foot and end of the bow are preserved. The deep but short catch-plate and the knob terminal end to the foot place this specimen in the same group as 2.3; Gencheva 1987, type I/4, also as type 8e, Gencheva 2004, 27.
Copper alloy. Length 16mm.
SF 2456, B 249, primary level of cobbled road, 300–450.

Late Roman Crossbow brooches (Zwiebelknopffibeln)

2.5 Crossbow brooch
Foot and lower section of the bow preserved. The bow is separated from the foot by a flange and waisted stem. The foot has a central groove and is decorated with 3 pairs of dot-and-ring motifs, two at the end of the foot, the other at the junction with the bow. Possibly Keller Type 3 variant B (dated 340–360), more probably Keller type 4A (dated 350–380).
Copper alloy. Length 38mm.
SF 6217, C 130, cobbled road, 300–450.

2.6 Crossbow brooch
Foot and half of the bow preserved. The end of the bow is separated from the foot by a backward projecting flange and a waisted body. The foot has two central grooves and its mid section has chamfered sides. There are two pairs of dot-and-ring motifs at the base of the foot and two other pairs, irregularly offset, below the bow. Keller type 4 variant A (dated 350–380).
Copper alloy. Length 56mm.
SF 5281, A 2193, clay dump backfilling ditch 1 for the berm of ditch 2, 400–450.

2.7 Arm terminal from a crossbow brooch
The onion head is cast as one with the arm and separated from it by a cross-hatched collar. Keller, type 4 (dated 350–360).
Copper alloy. Length 17mm.
SF 2356, B 247, cobbled road, 300–450.

Other late Roman brooches

2.8 Brooch
The strongly arched, flat bow tapers towards the foot which continues to reduce in width. The only decoration consists of three transverse lines and an 'X' scratched on the end of the foot. Notable are the thin arms ending in simple plain knobs. A similar brooch comes from Novae; *Novaensia* I no. 319, Tabl. XXIX.6, Gencheva type 21a, ascribed to the 4th century, Gencheva 2004, 58–9.
Copper alloy. Length 80mm.
SF 8134, F 3192, backfill of robber-trench, 1750+.

2.9 Brooch (Bügelknopffibel)
The bottom of the foot is damaged. The pin is missing and the flange with central hole, which originally projected down from the head, is lost. Missing also is the knob terminal which was retained in the hole at the top of the head. A heavy bow, in section a truncated cone. The short foot, its sides chamfered, has a raised band below its junction with the bow. Somewhat more elegant versions come from Novae; *Novaensia* I no. 321 Tabl. XXIX.2, *Novaensia* V, no. 136, Tabl. XXXIII.8. Bügelknopffibeln belong to the 4th and early 5th century; M. Schulze-Dörrlamm 1986, 676–7. In the region, they are ascribed to the second half of the 4th century; Gencheva

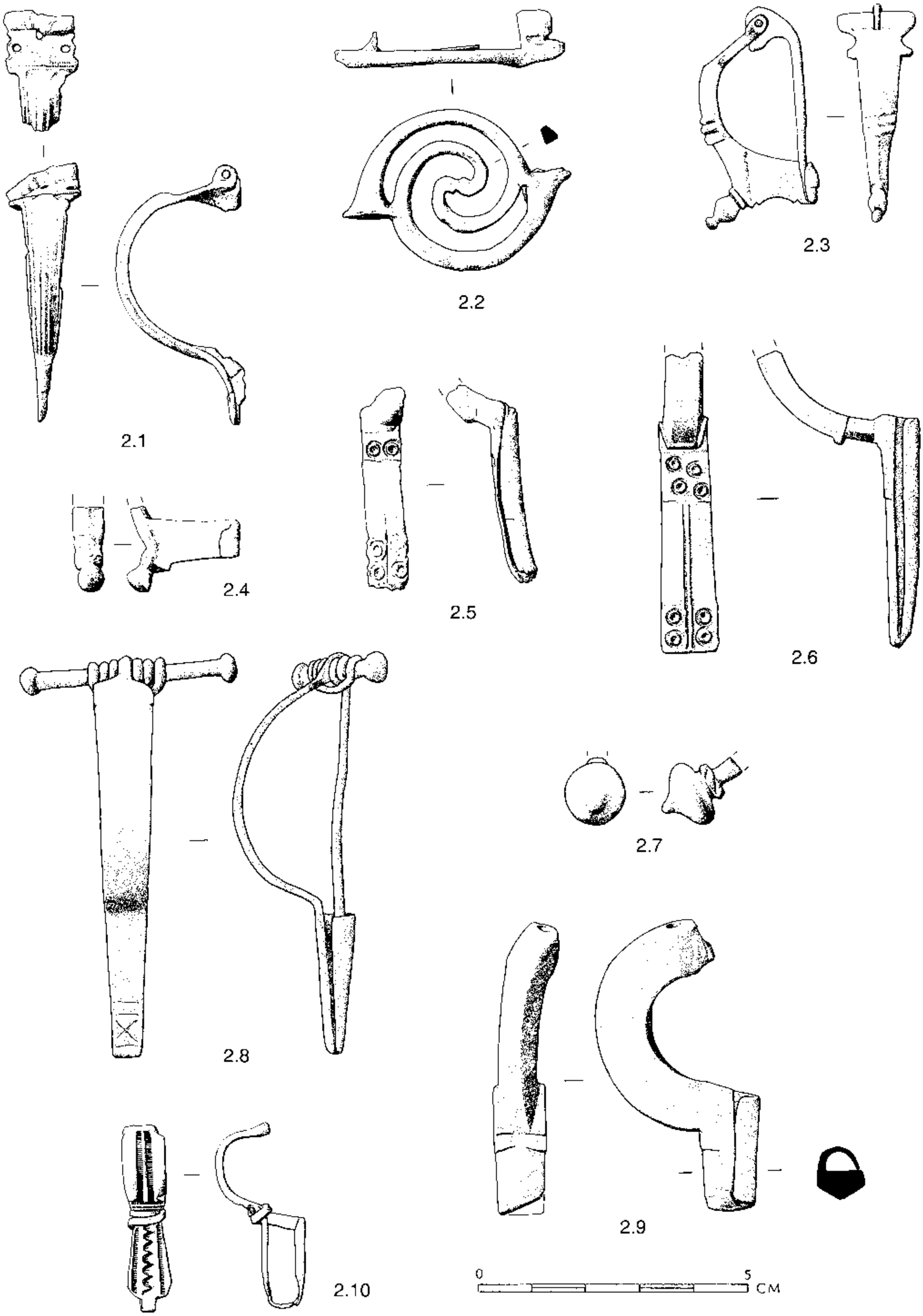


Fig 2.1 Brooches

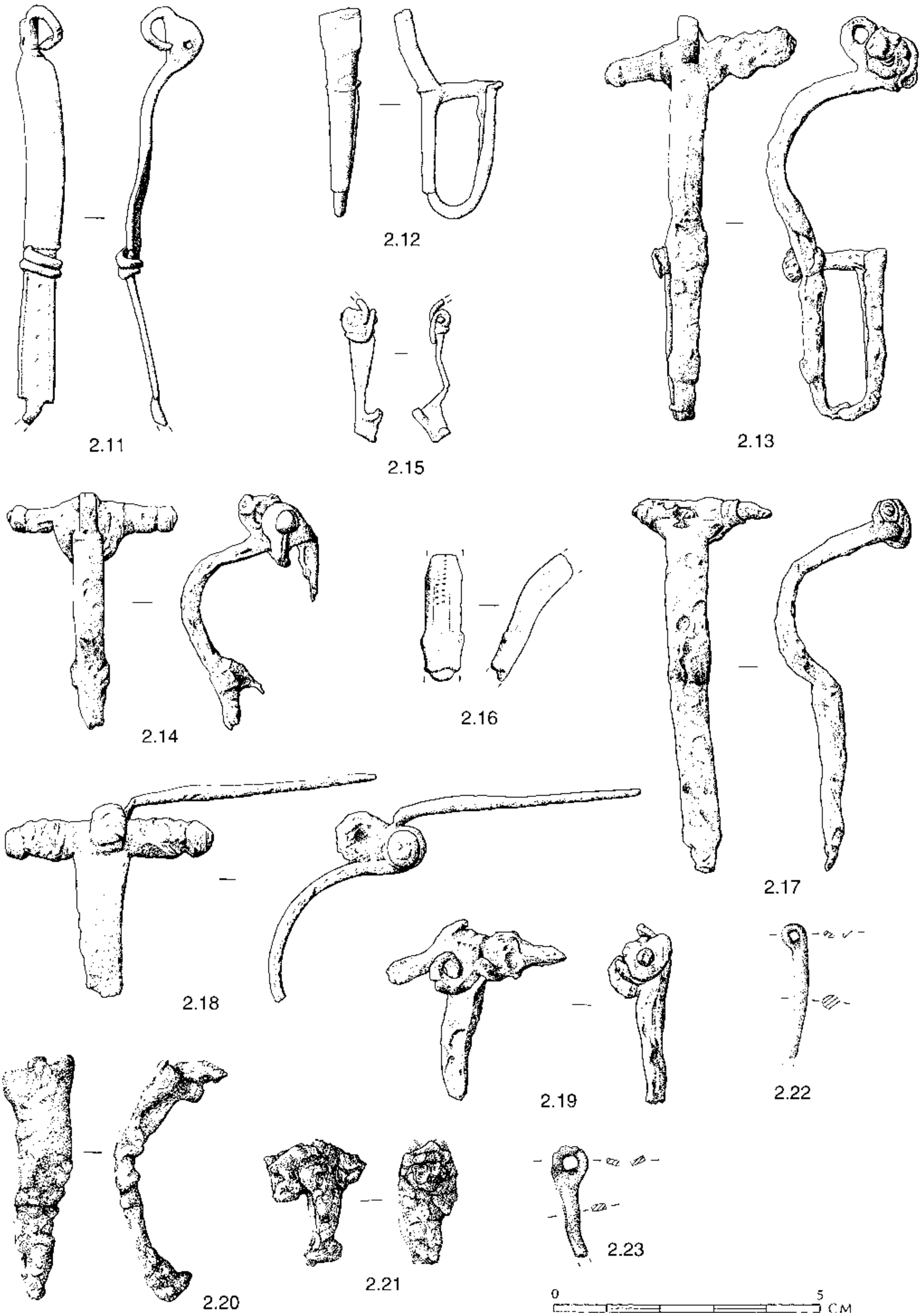


Fig 2.2 Brooches

2004, type 40, 124–5.
Copper alloy. Length 55mm.
SF 6058, C 101, soil accumulation, *c* 450.

Early Byzantine brooches with returned foot

2.10 Brooch with returned foot
The head is corroded and the backward projecting head hook has been broken off (see below, no. 2.11). The foot returns to form the catch-plate then bends upwards to wrap around the bottom of the bow. Two sets of parallel grooves with fine transverse lines decorate the foot, either side of a central zig-zag groove. The bow has two medial grooves with the same internal decoration as well as two other transverse lines of fine cuts across the width of the bow at its junction with the foot. The pin is missing. This is a small and notably fine example of a well-known 6th century type. At Novae; *Novaensia* V, no. 137 Tabl. XXXIII.9 and Iatrus, *Iatrus* II nos. 261 and 263 Taf. 55. Also *Tropaeum Traiani* I, nos. 10.3 and 10.4 figs 174 and 175, Golemanovo Kale, Uenze 1992, Taf. 2.9 and 121,1–3. On the this type see Gencheva 1989, 32 and fig 1.i, Uenze 1992, 146–149. In the region, this type has been assigned to the second half of the 6th or early 7th century; Gencheva 2004, type 20b, 57–8.
Copper alloy. Length 35mm.
SF 3293, E 1086, backfill of robbed drain, 2nd period of occupation, 450–600.

2.11 Brooch with returned foot
Although the catch-plate is lost, the returning end, where it wraps around the junction of the bow with the foot, survives. The distorted bow is plain but the foot has a slightly bevelled central strip with a line of punched dots. A hook, springing from the head must have held a ring for attachment to a safety chain; *Iatrus* I, 151–2 (cf, Taf. 55 251), Uenze 1992, 150. Similar examples come from Novae; *Novaensia* 5 no. 127 Tabl. XXX111.1 and from Golemanovo Kale; Uenze 1992, Taf. 3.5, Taf. 121.4–5. Certainly a 6th century type, possibly in use as early as the end of the 5th century; Gencheva 1989, 32, Uenze 1992, 150–4, Gencheva 2004, type 20a, 56–7. The pin is missing.
Copper alloy. Length 78mm.
SF 2144, B 240, accumulation post-dating abandonment of the cobbled road, 450–1750+.

2.12 Brooch with returned foot
The bow, rounded in section, has an angular profile. Characteristically for this type of brooch, the tapering foot is abruptly waisted as it turns back to form the strongly looped catch-plate, at the end of which a right-angle return meets the junction of the bow and foot. Unlike nos. 2.10 and 2.11, the brooch is cast as one although a rib, where the bow meets the foot, recalls the wrapped around end characteristic of this group of brooches. Head and part of the bow missing. A well-attested late form, confined to the 6th century; Golemanovo Kale and Sadovsko Kale, Uenze 1992, 154–7, cf, Taf. 3.14–17, at Justiniana Prima (Tsarichin Grad), Kondich and Popovich 1977, nos. 33, 36–8 tab. XIII-XIV, Gencheva 1989, 34–5 and fig. 2a.
Copper alloy. Length 40mm.
SF 75, C 53, soil build-up, 1750+.

2.13 Brooch with high looped bow
It has a tapering foot which returns to form the catch-plate and then turns upwards at right angles to meet the junction between the foot and the bow. A circular projection on the head is pierced for attachment to to a safety chain or chord. The arms have knob terminals. Though corroded, two bulges on the foot suggest decoration. The pin is missing. This type is clearly related to the copper-alloy forms and also belongs in the 6th century; Uenze 1992, 149 and Taf. 2, 10, 11, 13 (Sadovsko Kale and Golemanovo Kale).
Iron. Length 75mm.
SF 6034, C 91, robbing debris, 1750+.

2.14 Brooch with high looped bow
The tapering foot and pin are broken. The catch-plate is missing. However, the end of the returned foot, where it meets the junction between foot and bow, is preserved, as is the corroded attachment loop on the head. Both arms have knob terminals. Same type as above, No. 2.13.
Iron. Length 44mm.
SF 3194, E 1065, drain fill (contaminated by post-medieval robbing), 450/1750+.

Indeterminate types

2.15 Brooch
The foot has been bent back and the pin is missing. This simple small brooch has a strongly tapering bow.
Copper alloy. Length 27mm.
SF 6587, C 4103, make-up deposit for the berm, 300–450.

2.16 Brooch ?
Rectangular section with a roughly enlarged end (at the junction between the foot and the bow). The flat top of the bow is decorated with two rows of dots. Fragment.
Copper alloy. Length 26mm.
SF 2220, B 244, cobbled road, 300–450.

2.17 Brooch
The spring is heavily corroded, the arms broken. The foot tapers towards the end which is lost. It may have had a returned foot as above 2.13. Pin missing.
Iron. Length 70mm.
SF 5262, A 2235, occupation surface around early Byzantine oven, 450–600.

2.18 Brooch with strongly curved bow
The foot is missing but the bent pin (48mm in

length) is complete. A suspension loop surmounts the head and the arms terminate in cone-shaped knobs. Although the junction with the foot has not survived, this example is similar to above no. 2.13; it may have had a returned foot.
Iron. Length 40mm.
SF 8196, F, u/s.

2.19 Head of a brooch
The remaining section of bow is distorted and the foot is missing. It has a suspension loop on the head. Arms broken. Pin missing.
Iron. Length 32mm.
SF 2127, B 240, accumulation post-dating abandonment of the cobbled road, 450–1750+.

2.20 Brooch
A simple arched bow, tapering towards the foot and with a triangular head.
Pin missing and heavily corroded.
Iron. Length 46.5mm.
SF 13045, R 5218, make-up for tower floor, *c* 450.

2.21 Head of a Brooch
Heavily corroded fragment.
Iron. Length 21mm.
SF 14255, P 5018, make-up for the primary floor of the tower, *c* 450.

2.22 Brooch pin
Wire shaft of circular section. End missing.
Copper alloy. Length 24.5mm.
SF 6173, C 123, soil make-up within the cobbled road surface, 300–450.

2.23 Brooch pin
Rectangular sectioned shaft. End missing.
Copper alloy. Length 21mm.
SF 3276, E 1087, primary silting within the early Byzantine drain beneath the gate, 450–600.

PINS (Fig 2.3)

Note, bone pins are described separately (below, pp. 65–70).

2.24 Pin
The head has an elliptical lower half and a conical top.
Copper alloy. Length 84.4mm.
SF 5118, A 2118, backfilling of late Roman ditch, *c* 450.

2.25 Pin
Tapering shaft with a simple conical top no wider than the stem.
Copper alloy. Length 125mm.
SF 4444, D 610, pit-fill, 350–450.

2.26 Pin
Tapering shaft with a simple conical top no wider than the stem. Tip missing.
Copper alloy. Length 83.5mm.
SF 4443, D 601, pit-fill, 350–450.

2.27 Pin
Tapering shaft with round head.
Copper alloy. Length 68mm.
SF 8293, F 3348, silty accumulation, 400–450.

2.28 Pin
The head has an elliptical lower half with a conical top. Shaft broken.
Copper alloy. Length 34mm.
SF 2365, B 248, road surface, 300–450.

2.29 Pin
Spherical head with round-sectioned shaft below then a roughly square sectioned shaft before again becoming round in section at the tip. Although the pin may be broken, the end does now (after conservation) narrow to a point and the bent shape of the object suggests that it may have been hammered through and bent back: possibly a decorative nail although the shaft is surprisingly long.
Copper alloy. Length 55mm.
SF 12469, M 4973, beneath collapsed wall-plaster covering the floor of room 2 in the Roman house, 250–350.

BEAD (Fig 2.3)

2.30 Bead
Copper alloy. Diameter 15.8mm, width 6.8mm.
SF 7045, F 3012, topsoil, 1750+.

BRACELETS AND NECKLACE (Fig 2.3)

2.31 Bracelet?
Strip of metal, slightly splayed at one end. Distorted. If used as an armlet, it must have been for a young child.
Copper alloy. Length 100mm, width 4mm, thickness 1.9mm.
SF 4264, D 473, destruction level, 450–600.

2.32 Bracelet
Fragment of a bracelet made from three strands of metal, twisted together and held by two metal clasps of wire.
Copper alloy. Length of fragment 18.3mm. Max. diameter 13.4mm.
SF 6409, C 130, secondary cobbled road surface, 300–450.

2.33 Necklace
Two thin pendant leafs of gold, joined at the back by gold wires bent to form the links of a chain, each link soldered to the back of a leaf.
Gold. Width of surviving section 14mm.
SF 12206, M 4886, topsoil, 1750+.

FINGER RINGS (Figs 2.3 and 2.4)

2.34 Finger ring
D-shaped section. The broad part of the hoop is set with an intaglio (see Henig, no. 5.2, pp. 86–7). Lower half missing.
Copper alloy. Internal diameter 19mm.
SF 12080, M 4835, pit-fill, 450–600.

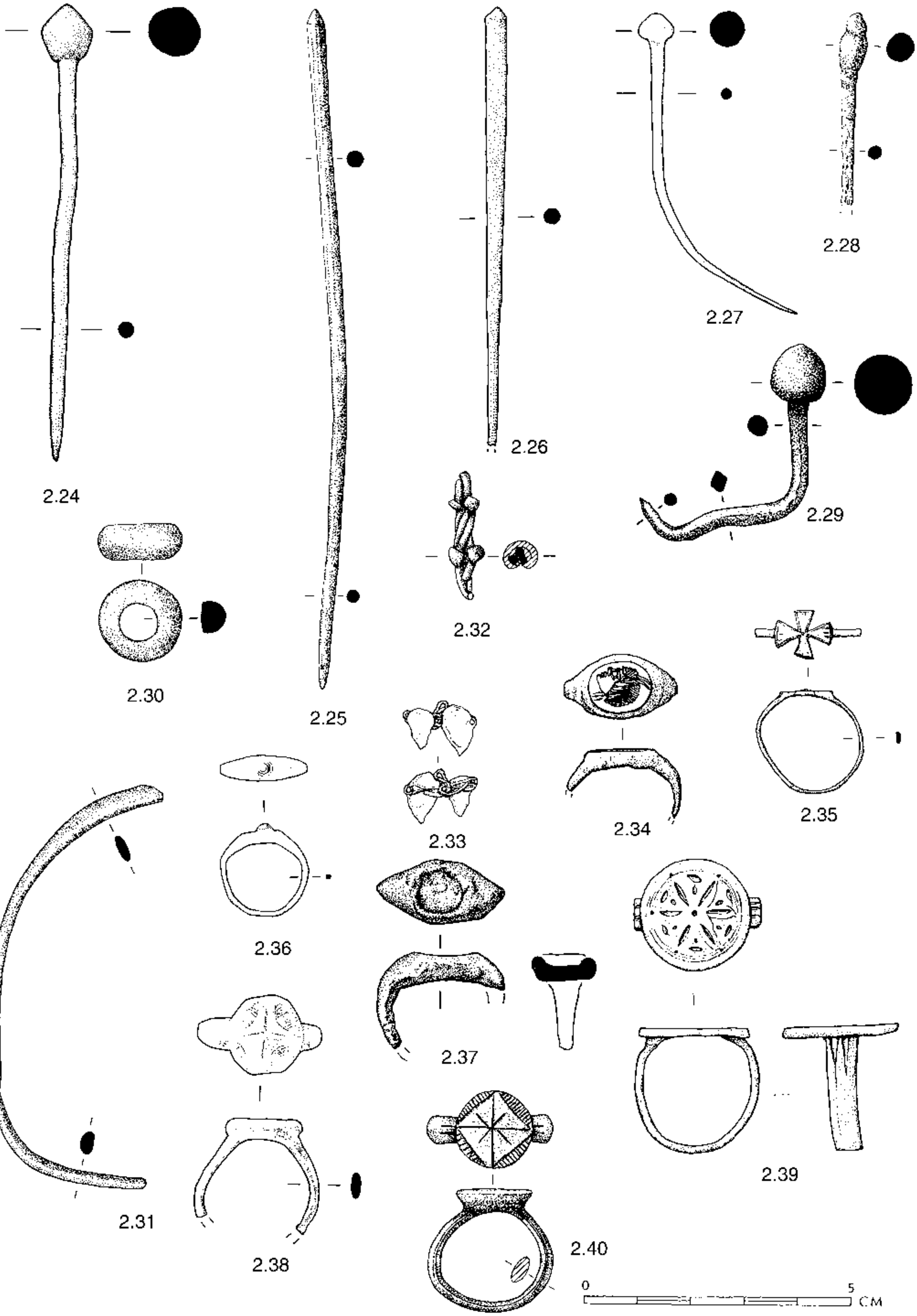


Fig 2.3 Jewellery

2.35 Finger ring
Decorated with equal-armed cross. Each arm has faint traces of incised lines at the splayed ends.
Copper alloy. Internal diameter 17.8mm.
SF 4560, D 473, destruction layer over floor of the 'workshops', 450–600.

2.36 Finger ring
Slightly D-shaped. The broad part of the hoop is set with a cream-coloured dot of glass.
Copper alloy. Internal diameter (max) 14mm.
SF 13026, R 5218, make-up dump using material brought in from the destruction level covering the Roman city, *c* 450.

2.37 Finger ring
D- shaped with a setting for a lost intaglio on the thicker part of the hoop. Three quarters of the hoop missing.
Iron. Internal diameter 20mm.
SF 14624, P 5051, make-up taken from destruction level in Roman city, *c* 450.

2.38 Finger ring
Undecorated hoop surmounted by a flat, irregularly shaped plate, decorated with scratched, semi-circular marks within each of the four segments of a crude, centrally incised cross. 1/3 of the hoop missing. Probably post-medieval.
Iron. Internal diameter 21mm.
SF 14329, R 5005, robber-trench, 1750+.

2.39 Finger ring
Circular hoop, engraved on each side with two short triangular incisions below a flat, circular plate, decorated with six radiating, lozenge-shaped grooves with two sets of smaller cuts, running around the outside of the design, one at the end of each of the six segments and 6 still smaller 'drops' within the segments. Faint traces of two engraved circles surround the central motif. Probably post-medieval.
Silver. Internal diameter 19.7mm.
SF 7351, F 3062, robber-trench fill, 1750+.

2.40 Finger ring
A circular hoop surmounted by a flat, circular plate, incised with a diamond motif, emphasized around the outside by hatched lines and divided by two lines crossing at right-angles and from which junction four irregularly scratched lines subdivide each of the four triangular parts of the diamond. Probably post-medieval.
Silver. Internal diameter 20mm.
SF 13003, u/s.

2.41 Finger ring
D-shaped hoop with flat, lozenge-shaped top, crudely engraved with a 'V' and four slanting cuts. Probably post-medieval.
Copper alloy. Internal diameter (max) 21.1mm.
SF 5222, A 2183, undated.

2.42 Finger ring
Expandable circular ring with a flat irregular top formed by two overlapping undecorated plates, one at each end of the strip of metal which forms the hoop, decorated on the outside by two grooved lines.
Silver. Internal diameter 21mm.
SF 8109, F, u/s.

2.43 Finger ring
Circular hoop surmounted by round, flat plat. Heavily corroded and bent top. Probably post-medieval.
Iron. Internal diameter 20mm.
SF 6447, C 4007, topsoil, 1750+.

2.44 Finger ring
Simple thin hoop. Broken.
Silver. Internal diameter 17mm.
SF 6444, C 4006, topsoil, 1750+.

2.45 Finger ring
Very thin ring, 1.5mm wide, with a single grove serving as decoration on the outside.
Silver. Internal diameter 16.3mm.
SF 6443, C, u/s.

2.46 Finger ring?
A ring of metal, perhaps wrapped around at the end to make it adjustable. Distorted.
Copper alloy. Length 26.3mm.
SF 12311, M 4915, dump deposit, 350–450.

EARRINGS (Fig 2.4)

2.47 Earring?
Lobate end, slightly distorted, tapering towards the top.
Copper alloy. Length 21.3mm, internal diameter 13.9mm, thickness 1.82mm.
SF 6419, C 126, cobbled roadway, 300–450.

2.48 Earring?
Crescentric moon shaped strip of metal, 1.0mm thick, each end narrowing to a point. Bent.
Silver. Diameter (max) – as survives – 21.5mm.
SF 2037, B 224, final backfill of pit before construction of paved road, 130–150.

2.49 Pendant from an earring
The gold wire passes through a 5–sided green glass bead at the end of which is a slightly distorted suspension loop. The wire is bent at the other end to secure the bead. Distorted. Earring missing.
Gold and glass. Length 10.7mm.
SF 4420, D 541, robber-trench fill for wall of the 'early building', 350–450.

2.50 Pendant from an earring
The suspension wire ends in a loop for attachment to the missing ring. Dot soldered at the other end to secure the pearl.
Gold and pearl. Length 16.6mm.
SF 4181, D 451, tumble of stones probably from a wall beyond the area, 1750+.

2.51 Pendant from an earring?
The wire forms a suspension loop at one end, wraps around to thicken the stem as it passes

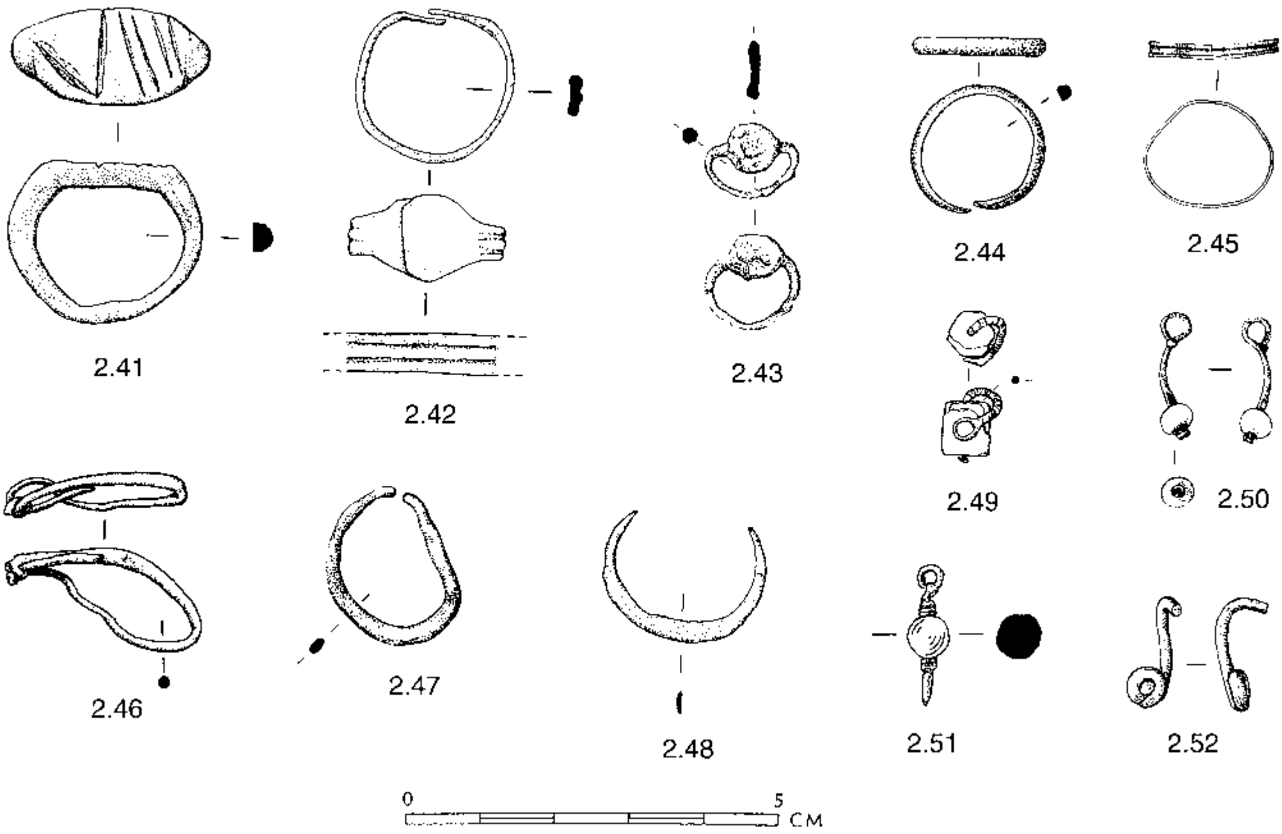


Fig 2.4 Jewellery

through a glass paste ball, then narrows again and ends in a point. Perhaps broken.
White metal. Length 18mm.
SF 5297, A 2260, pit-fill containing domestic rubbish, 100–130.

2.52 Earring
Round sectioned wire is coiled clockwise to form a decorative end. At the other, the tip of the hook is missing.
Copper alloy. Length 15mm, width across the coil 4.85mm.
SF 6290, C 130, cobbled road surface, 300–450.

BELT FITTINGS (Fig 2.5)

2.53 Strap-end
Simple strip of metal folded over lengthwise with cross and line decoration scratched on one side.
Copper alloy. Length 41.2mm.
SF 11001, L, u/s.

2.54 Strap-end
Simple thin strip of metal with rounded end and slight edging cuts as decoration above the rivet.
Copper alloy. Length 33.5mm.
SF 6428, C 120, cobbled road surface, 300–450.

2.55 Strap-end
Sturdy strip of cast metal with slit end joined by a rivet.
Copper alloy. Length 32.6mm, width 10.3mm, thickness (max) 4.2mm.
SF 2580, B 274, cobbled road surface, 300–450.

2.56 Strap-end
Flat strip with lentoid body and notched decoration below the triangular loop, pierced by a triangular hole.
Copper alloy. Length 30.1mm.
SF 14406, P 5050, make-up deposit taken from the destruction level in the Roman city, *c* 450.

2.57 Strap-end
Lozenge-shaped flat strip with round terminal and rectangular tie end pierced by a rectangular hole for attachment.
Copper alloy. Length 39mm.
SF 12376, M 4971, *in situ* destruction level within room 2 of the Roman house, *c* 250.

2.58 Part of a hinged strap-end
A tapering strip of metal with a hole at one end for a rivet which would have attached it to a leather belt. At the other, two projecting lugs are both pierced to hold the missing cross pin which would have formed the hinge. Fixed by the hinge, there would have been a decorative terminal. These interlinked strap-ends are found, if infrequently, on the German frontier and date no earlier than the second half of the 2nd century; Oldenstein 1976, nos. 325–330, Taf. 37 and p. 147.There is no reason to assume that this specimen had any military association.

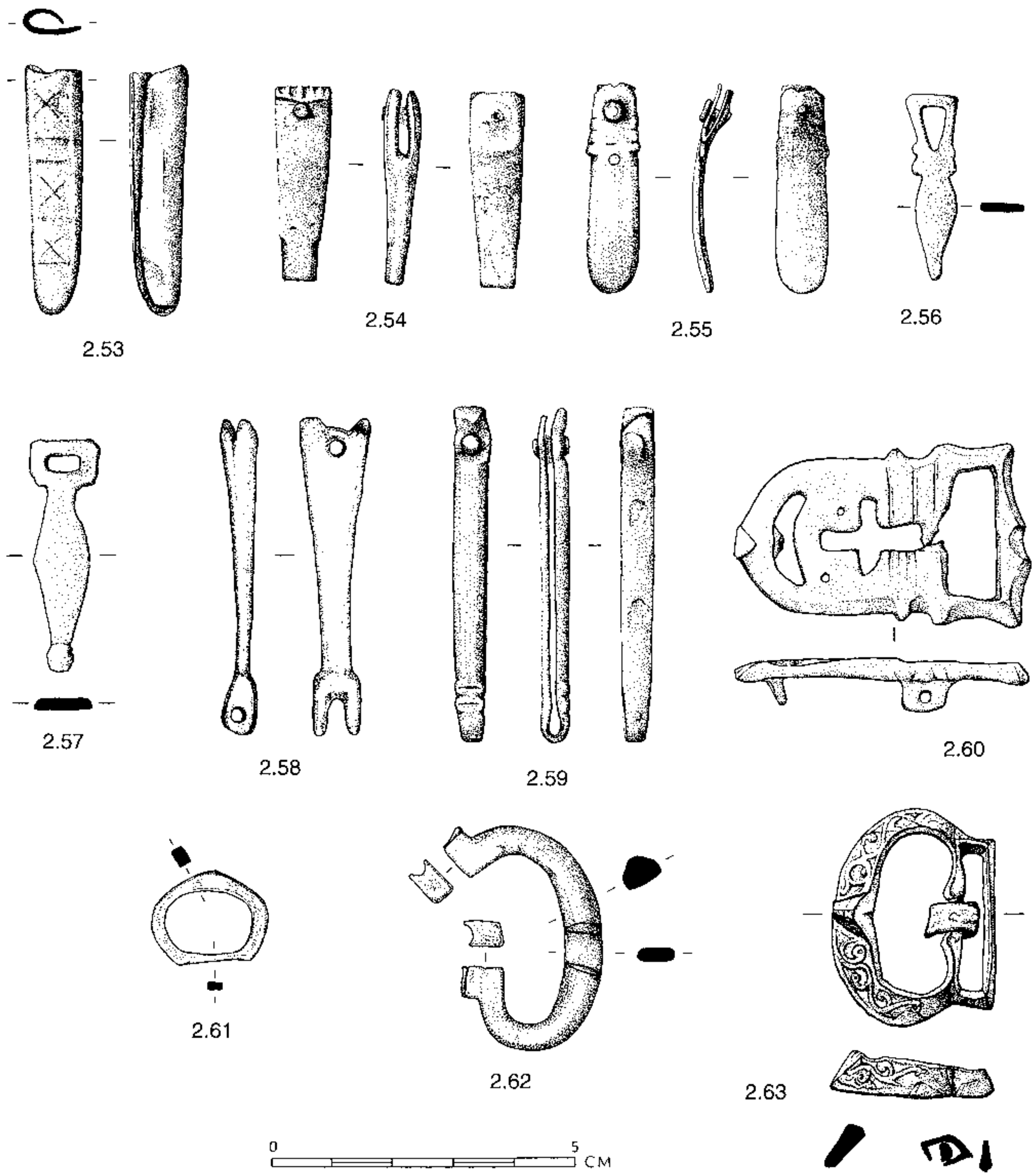


Fig 2.5 Belt Fittings

2.59 Belt-stiffener
A single strip folded into two, the ends riveted together. The belt must have been made from very thin leather, *c* 1.5mm thick.
Copper alloy. Length 55mm, width 4.2mm.
SF 4127, D 445, primary collapse over floor in west room of the 'workshops', 450–600.

2.60 'Sucidava' belt buckle
A good example of this type of buckle with central cross and a crescent-shaped cut, notched decoration on the edge and with a rounded end, terminating with a knob (cf, Uenze 1992, bd. 2, Taf. 12, 7 and bd.1, 184–6). The projecting rib beneath the buckle is pierced by a central hole for attaching the pin. The Sucidava buckle occurs widely in the Balkans, is found at Tsarichin Grad, and, consequently, can be firmly dated to the mid to late 6th century. Pin missing.
Copper alloy. Length 47.5mm.
SF 3266, E 1088, primary fill of drain beneath

early Byzantine gate, 450–600.

2.61 Buckle
Standard early Byzantine form, oval in shape with slightly pointed end and a narrow vertical back for attachment to a strap. Pin missing.
Copper alloy. External width 149mm.
SF 14030, A 2208, backfill of late Roman defensive ditch, 450–600.

2.62 Buckle
Simple oval shape with rounded profile and central cut to hold the end of the pin. Distorted.
Copper alloy. Length 36.8mm.
SF 6002, C 74, robber spoil, 1750+.

2.63 Buckle
Stylized vine tendril decoration on the face and sides, with a rectangular attachment for the belt. End of pin lost. Probably post-medieval.
Copper alloy. Length 35.2mm.
SF 10164, K 4432, post-medieval robber-trench for north wall of the nave, 1750+.

TOILET, SURGICAL OR PHARMACEUTICAL INSTRUMENTS (Figs 2.6 and 2.7)

2.64 Nail cleaner from a chatelaine?
With suspension loop and splayed shaft with central rib on one side, flat on the other.
Copper alloy. Length 18.5mm.
SF 6334, C 130, cobbled road surface, 300–450.

2.65 Tweezers
Flat parallel-sided blades.
Copper alloy. Length 61mm, width of blades 4.8mm.
SF 4445, D 604, destruction deposit in the 'early building,' 350–450.

2.66 Tweezers
Flat parallel-sided blades. Squashed flat.
Copper alloy. Length 46.9mm, width of blades 14.9mm.
SF 7264, F 3045, robber-trench fill, 1750+.

2.67 Spoon probe
The round-sectioned shaft below the probe is undecorated but terminates in a bead-and- (triple) reel moulding. All but the shaft end of the spoon is missing.
Copper alloy. Overall length 128.5mm. Length of probe 13.3mm.
SF 4588, D 659, destruction deposit within the 'early building', 250–350.

2.68 Probe
Probably a spoon probe. Shaft broken.
Copper alloy. Overall length 31.6mm. Length of probe 11.7mm.
SF 4719, D, u/s.

2.69 Spatula
Leaf-shaped blade with a round-sectioned handle, terminating in a cone-shaped terminal. Cast.
Copper alloy. Length 156mm.
SF 5138, A 2128, backfill of late Roman defensive ditch, *c* 450.

2.70 Spatula?
Cast. A narrow, leaf-shaped blade which splays outwards towards its end which terminates in a rounded point. Bead-and-reel moulding at the junction with the shaft which narrows to a point. Tip missing. Perhaps hafted onto a bone handle. However, it is possible that the waisted end represents damage: it may have been part of a spoon probe. Bent.
Copper alloy. Length 82mm.
SF 6194, C 130, cobbled road surface, 300–450.

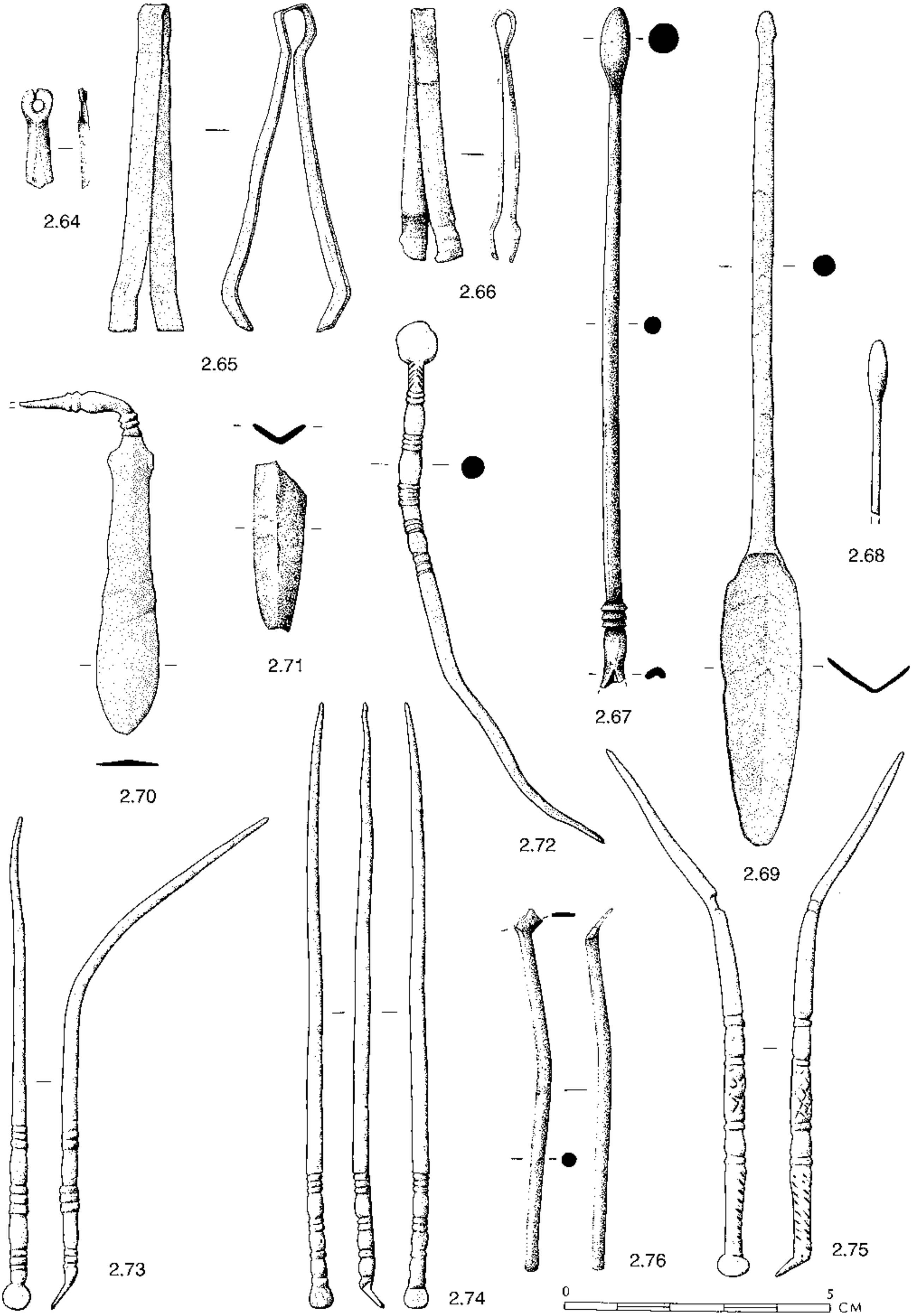
2.71 Spatula
Section of leaf-shaped spatula. The tip and shaft end of the blade are missing.
Copper alloy. Length 32.3mm.
SF 4274, D 516, pit-fill, 450–600.

2.72 Toilet spoon
The scoop is round and flat. The shaft tapers to a pointed end and is decorated below the scoop with two lines of incised cuts, followed by bead-and- (triple) reel moulding. Bent.
Copper alloy. Length 119.6mm, diameter of scoop 7.3mm.
SF 3316, E context uncertain but definitely from backfill of early Byzantine drain (end of phase 1), 450–600.

2.73 Toilet spoon
The scoop is round and flat. The shaft tapers to a point and has bead-and- (triple) reel decoration at its junction with the scoop.
Length 110mm, diameter of the scoop is 5.5mm.
SF 8113, F 3250, floor make-up for the post-medieval grubenhaus, 1750+.

2.74 Toilet spoon
The round shaft tapers to a point at one end and terminates with a flat scoop at the other. Above the scoop, the shaft has a bead-and-reel, then bead-and- (double) reel, followed by bead-and- (triple) reel decoration. Notable, however, is it that the bead-and-reel decoration is absent on the front – although this is presumably due to poor manufacture and not wear: both the decorated and the undecorated sections still retain traces of white metal. Slightly bent tip.
Copper alloy, plated with white metal. Length 113.1mm, diameter of scoop 4.5mm.
SF 8136, F 3241, dissolved mudbrick, representing abandonment of the area, 400–450.

2.75 Toilet spoon
The shaft ends in a point and, at the other, in a flat scoop. It has pecked incisions at the junction with the scoop, then bead-and-real decoration although the central, longer bead also has crosshatched decoration.
Copper alloy. Length 110mm, diameter of scoop 6.2mm.
SF 14135, P 5018, make-up deposit taken from



Figs 2.6 Toilet, Surgical/Pharmaceutical Instruments

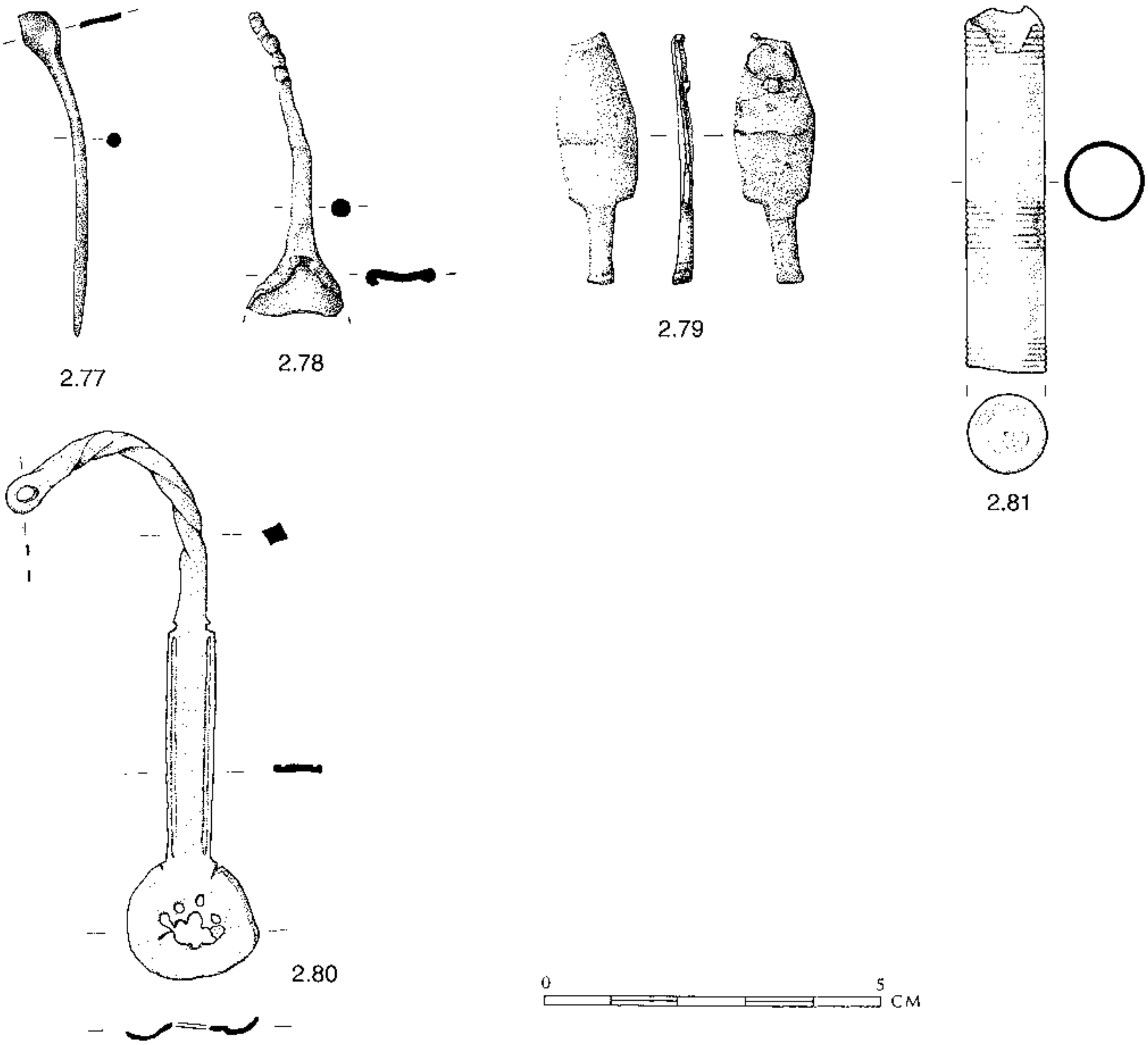


Fig 2.7 Toilet, Surgical/Pharmaceutical Instruments

the destruction level within the Roman city, *c* 450.

2.76 Toilet spoon
The round-sectioned shaft has a rounded top and, at the other end, terminates in a scoop which is irregular in shape and apparently broken – if not crudely manufactured.
Copper alloy. Length 69.0mm, diameter of scoop 4.5mm.
SF 6032, C 93, robbing debris, 1750+.

2.77 Toilet spoon
The plain shaft ends in a point and the flat scoop is distorted.
Copper alloy. Length 49.9mm, diameter of scoop 5.3mm.
SF 2275, B 247, primary cobbled road surface, 300–450.

2.78 Toilet spoon
Distorted, damaged handle, the bowl distorted and broken.
Copper alloy. Length 45mm.
SF 5261, A 2244, dump deposit, date uncertain.

2.79 Toilet spoon?
A crude instrument with a flat, angular blade, the tip of which has broken off. The handle is broken unless the projecting plate was a tang and the blade was hafted – which seems unlikely.
Copper alloy. Length 37.3mm.
SF 6427, C 120, latest cobbled road surface, 300–450.

2.80 Spoon strainer
The shallow bowl, though distorted and missing part of its centre, had at least seven small holes for straining liquid – perhaps for cosmetic or

medicinal purposes. The shaft is formed from a rectangular strip, decorated with two parallel grooves, one running along each side if the upper surface. Above the notched junction with the shaft, the handle is made from twisted wire and ends in a suspension loop, presumably for attachment to a chatelaine. Bent handle and damaged bowl.
Silver. Length 109.0mm, diameter of bowl 17.4mm, diameter of twisted wire handle 2.3mm.
SF 2208, B 244, second layer of cobbled road surface, 300–450.

2.81 Cosmetic instrument holder?
A hollow tube decorated with three bands of concentric grooves cut by spinning on a lathe. The bottom section survives.
Copper alloy. Length 54.1mm. Internal diameter 10.8mm.
SF 1144, D 425, floor of post-medieval building, 1750+.

DOMESTIC INSTRUMENTS, UTENSILS AND FURNITURE

STYLI (Fig 2.8)

2.82 Stylus
The eraser is waisted and the oval-shaped shaft is decorated by two bead-and- (double) reel mouldings. The pointed end is round-sectioned and slightly bent.
Copper alloy. Length 176mm.
SF 5226, A 2208, 450–600.

2.83 Stylus
Simple flattened eraser, tapering stem narrowing to the point. Bent.
Iron. Length 118mm.
SF 1088, B 218, soil layer sealed beneath the cobbled road surface, 200–300.

2.84 Stylus
Simple round stem and flattened eraser. Broken and the point is missing.
Iron. Length 87mm.
SF 10196, K 4432, robber-trench fill, 1750+.

NEEDLES (Fig 2.8)

2.85 Needle
Thin body with rectangular eye. Broken above the eye.
Copper alloy. Length 52.6mm, width (max) 3.5mm.
SF, 2499, B 248, road surface, 300–450.

2.86 Needle
The flat spatulate head is pierced by a rectangular eye. Bent.
Copper alloy. Length 62.0mm, width (max) 7.4mm.
SF 4658, D 676, ditch fill, 175–250.

2.87 Needle
Round, tapering stem with a round eye. Roman or post-medieval.
Iron. Length 67.4mm.
SF 67, C 46, rough cobbled spread, 1750+.

METAL VESSELS (Figs 2.8 and 2.9)

2.88 Strainer
Three joining fragments from a thin-walled strainer. They comprise parts of the bottom and lower side of the vessel, the latter (but not the base) perforated by vertical lines of holes.
Copper alloy. Irregular sized fragments. Width (max) 53.5mm.
SF 12374, M 4970, destruction level, *c* 250.

2.89 Strainer
A single fragment from a thin-walled colander, with three parallel lines of punched holes, probably from the side of the vessel.
Copper alloy. Length 31.0mm.
SF 3338, E 1189, pit-fill, 400–450.

2.90 Base of a metal vessel
The plate has a central raised circular ridge and a second, approximately half way towards the outer edge. The vessel has been turned on a lathe. Possibly part of a small skillet. Lower sections of the sides survive although the fragment has been squashed flat, no doubt cut up for recycling.
Copper alloy. Diameter of the base 77.0mm.
SF 4714, D 699, fill of a very early pit, cut soon after tree-clearance, 130–150.

2.91 Cap for a circular metal box?
Plain, circular cap with straight sides. Possibly post-medieval.
Copper alloy. Diameter 33.6mm.
SF 7156, F 3034, fill of post-medieval grubenhaus, 1750+.

2.92 Handle for a small copper-alloy vessel
The central section of the handle is twisted to add a decorative touch and the hooked ends turn up to interlock with holes or loops attached the missing vessel. Bent.
Copper alloy. Length 72mm.
SF 6433, M 4006, topsoil, 1750+.

2.93 Handle probably from a metal vessel
Circular, looped handle with two flat projections pierced by holes, one of which still retains its rivet.
Copper alloy. Length 35.5mm.
SF 8358, F 3361, accumulation of dissolved mudbrick, 400–450.

2.94 Suspension chain and attachment from a metal vessel
A broken figure-of-eight link attached to a ring and plate, pierced by a rivet hole, 3.0mm in diameter.
Copper alloy. Length 56.0mm.
SF 11018, C 5305, fill of Roman defensive ditch, 250–350.

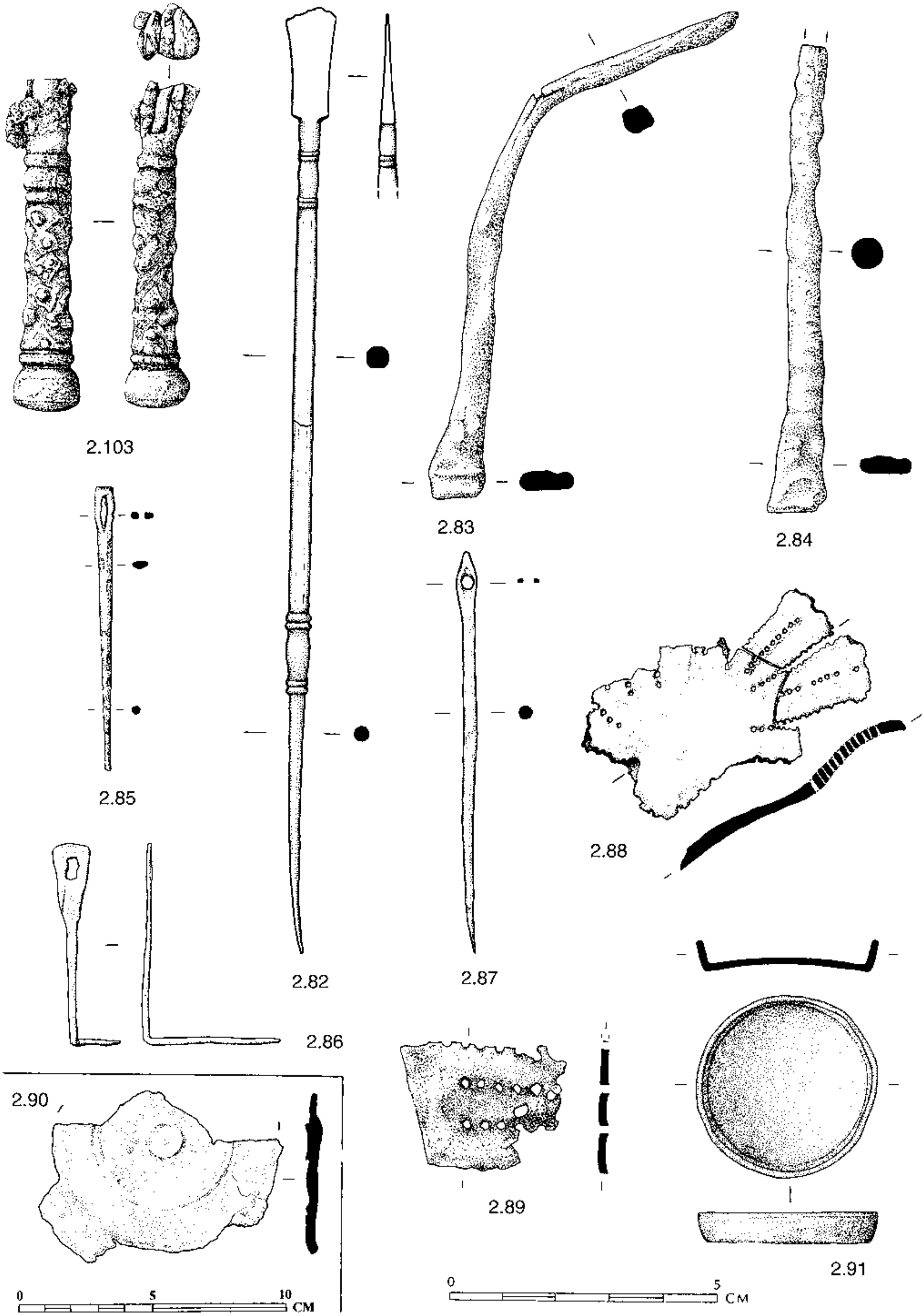
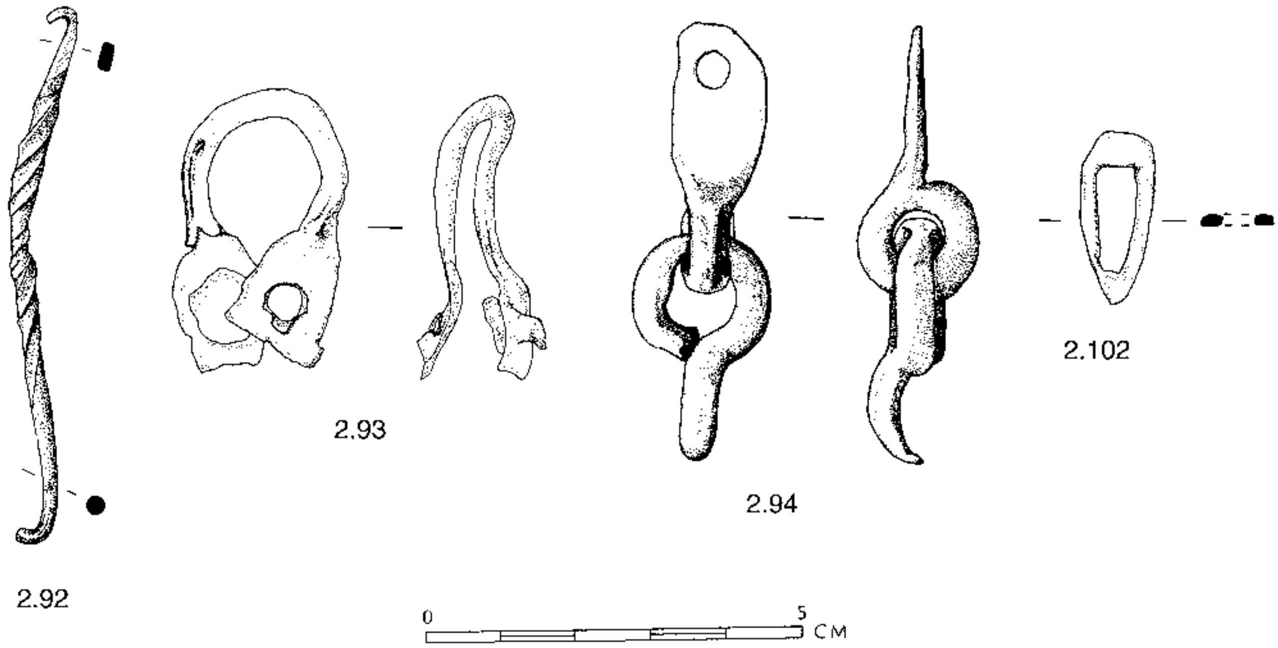
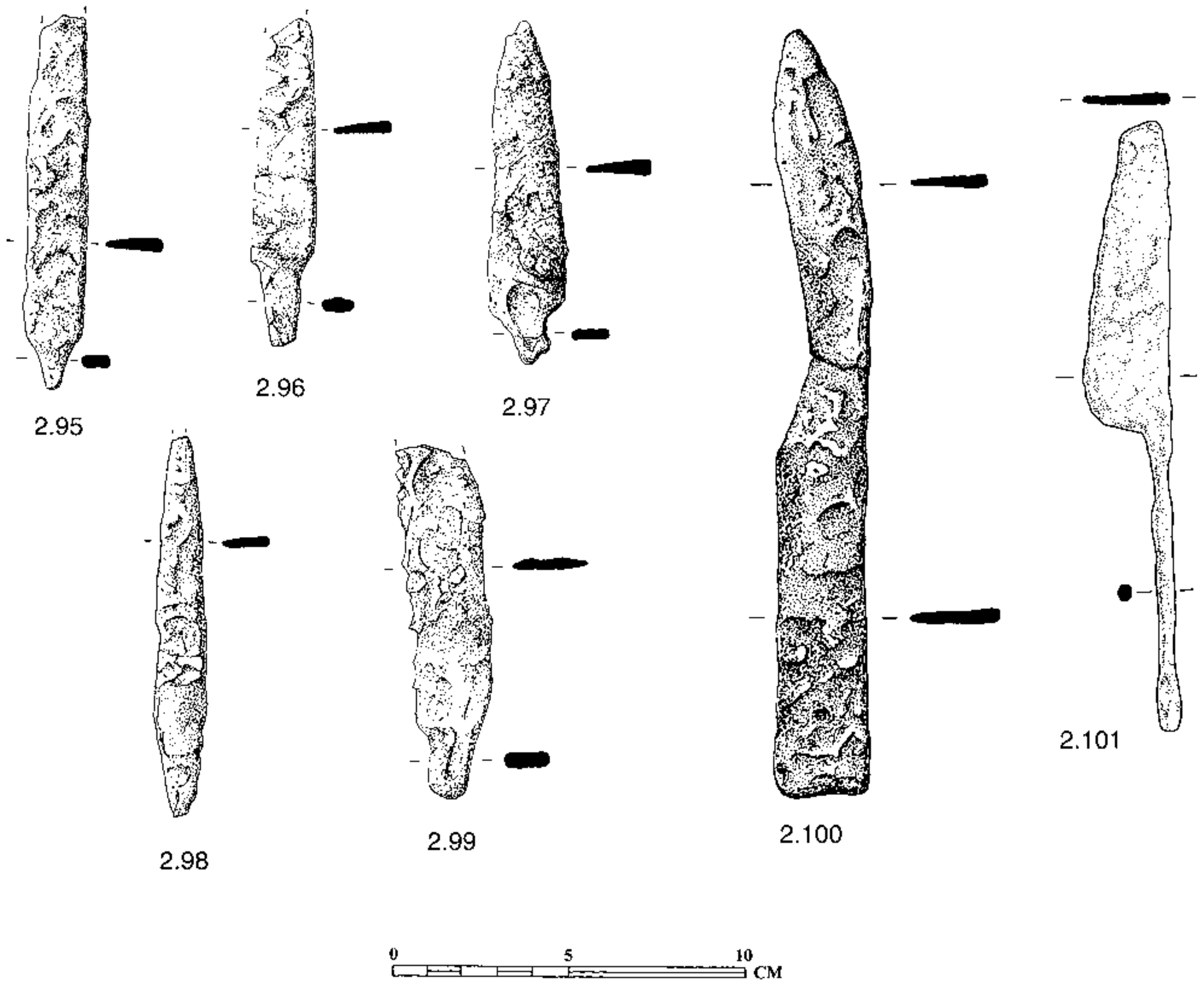


Fig 2.8 Styli, Needles and Metal Vessels



2.92 2.93 2.94 2.102



2.95 2.96 2.97 2.98 2.99 2.100 2.101

Figs 2.9 Metal Vessels and Knives

KNIVES (Figs. 2.8 and 2.9)

2.95 Knife blade.
The sides of the thin blade are parallel and the edge turns up at an angle of 45 degrees to meet the back. Tip missing and tang broken.
Iron. Length 103.7mm.
SF 5121, A 2118, backfill of the late Roman defensive ditch, *c* 450.

2.96 Knife blade
The sides of the blade taper slightly. The edge turns up at an angle of 45 degrees to meet the back. The tang is broken and the point blunted.
Iron. Length 90.0mm.
SF 3250, E 1036, occupation surface, 450–600.

2.97 Knife blade
The sides of the blade taper towards the point. The narrow tang is bent and broken.
Iron. Length 96.0mm.
SF 3294, E 1087, fill of drain beneath the south gate, 450–600.

2.98 Knife blade
The blade has parallel edges which then taper towards the point. The tang is broken and waisted by corrosion. The point is missing.
Iron. Length 105.3mm.
SF 6420, C 135, rubble backfill dumped after the Roman gate is blocked, *c* 450.

2.99 Knife blade
The sides of the blade are parallel. The edge is serrated, possibly due to wear, more probably due to corrosion. Both the tang and end of the knife are broken.
Iron. Length 98.5mm.
SF 4584, D 656, dump deposit, 350–450.

2.100 Knife
The blade turns sharply downwards, widens then tapers towards the point. The complete tang is rectangular in shape.
Iron. Length 213.0mm.
SF 6193, C 130, cobbled road surface, 300–450.

2.101 Knife blade
The back continues the line of the rounded tang and the edge of the wide blade slopes upwards toward the point. Possibly post-medieval given its unusual form and context.
Iron. Length 169mm.
SF 6452, C 4007, topsoil, 1750+.

2.102 Knife plate (for protecting the handle at its junction with the blade)
A thin plate with a rectangular, tapering slot for the insertion of the tang.
Copper alloy. Length 22.2mm. Thickness 1.5mm. Length of slot 14.8mm.
SF, 5274, A, u/s.

2.103 Knife handle
Round sectioned handle with knob and reel end and, at the other, three circular rings before a slot for insertion of the now missing blade. The body is decorated with a design of irregular lozenges and dots.
Copper alloy. Length 69.1mm.
SF 12068, M 4835, pit-fill, 450–600.

BOXES AND BOX FITTINGS (Fig 2.10)

2.104 Handle
The ends of the handle are splayed and the ends broken. Possibly a bracelet.
Copper alloy. Width 26.5mm.
SF 6432, C 4006, topsoil, 1750+.

2.105 Handle?
Simple round-sectioned handle with one distorted flattened end, roughly decorated with a ring of repoussé dots, the other end broken. Bent.
Copper alloy. Length 44.7mm.
SF 2007, B 210, accumulation after abandonment of the cobbled roadway, 450–600.

2.106 Decorative terminal or handle
Heavy, roughly moulded and with three circular grooves for decoration on the top. If it did serve as a handle, it was perhaps for a drawer. Possibly, a decorative finial for a bed or chair. Broken shaft.
Copper alloy. Length 45.0mm.
SF 12449, M 5516, on the clay floor in room 2 of the Roman house, *c* 250.

2.107 Bell-shaped stud
The head is spindle-shaped and the upper end has a cup-like form with a central raised cone. The rectangular sectioned shaft is broken. Probably a box handle but possibly a decorative finial for furniture or even a lock-pin.
Copper alloy. Length 37.0mm.
SF12226, M 4896, occupation surface, 1750+.

2.108 Handle or lock-pin
Circular head with central cone and raised rim. The rectangular-sectioned shaft is broken. Probably for a small box.
Copper alloy. Length 13.2mm.
SF 8274, F 3342, make-up for occupation surface, 400–450.

2.109 Hasp
Angled plate with crosshatch decoration on the top. The splayed end is broken. Presumably from a small box or casket.
Copper alloy. Length 55.0mm.
SF 8328, F 3337, soil accumulation above cobbled road surface, 400–450.

2.110 Decorative plate
This fragment includes one corner of a decorative plate. One rivet hole is visible (top left) and raised moulding follows the short preserved section of the edge (left). A second more pronounced raised moulding follows the edge then turns right. Too large for a belt plate. Probably decorative appliqué for a box.
Copper alloy. Length 49.1mm.
SF 12238, M 4906, accumulation, 450–600.

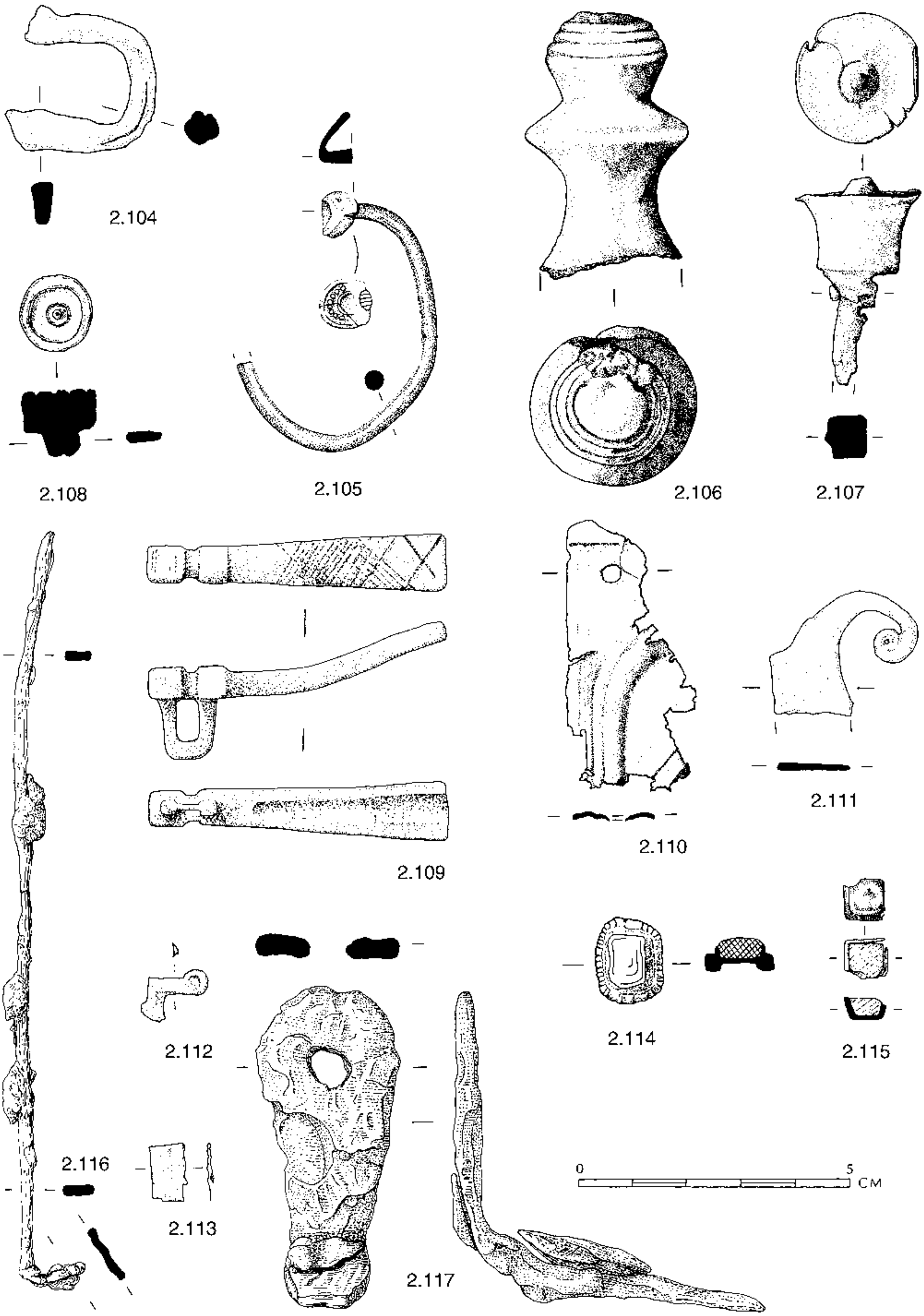


Fig 2.10 Box Fittings

2.111 Decorative plate
A fragment of a flat plate with curved 'tendril,' pierced by a small hole, probably for a tack. Possibly decorative appliqué for a box.
Copper alloy. Length 22.2mm.
SF 3100, E 1040, secondary early Byzantine occupation surface, 500–600.

2.112 Decorative appliqué
Fine, moulded fragment.
Gold. Length 9.8mm.
SF 3182, E 1036, make-up for second phase of early Byzantine occupation, 500–600.

2.113 Decorative fragment
Plain, folded strip. Probably appliqué for a box or similar decorative object.
Gold. Length 10.2mm.
SF 4454, D 607, lower fill of pit, 400–450.

2.114 Mount
The rectangular casing has riling around the sides. The clasp holds a green glass setting. Probably used as decoration on a casket or small box.
Copper alloy and glass. Length 15.4mm.
SF 8133, F 3242, post-hole fill, 400–450.

2.115 Mount
The simple rectangular casing contains a glass setting. Possibly for a box.
Copper alloy and glass. Length 7.8mm.
SF 6207, C 128, primary cobbled road surface, 300–450.

2.116 Binding
This preserved section of plate was fixed by 5 (now corroded) rivets or nails to a wooden box or chest and includes the angled return for the adjacent side of the container. Broken at both ends.
Iron. Length 145mm, width 10mm.
SF 5290, A 2251, collapsed remains of a hearth, 450–600.

2.117 Angle-binding
On the well-preserved arm, the binding forms a lobate plate, pierced by central hole for a rivet or nail, probably for attachment to a wooden box or chest.
Iron. Length 105.0mm.
SF 3212, E 1036, occupation surface, 450–600.

MATERIALS ASSOCIATED WITH ANIMALS

HORSE HARNESSES (Fig 2.11)

2.118 Bridle bit
The ring end is incomplete and the other is broken.
Iron. Length 72.2mm.
SF 6137, C 121, cobble road surface, 300–450.

2.119 Harness fitting
The sturdy ring has two projecting lugs on opposing sides.
Copper alloy. Length 22.8mm.
SF 6254, C 130, secondary cobbled road surface, 350–450.

2.120 Harness fitting
Copper alloy. Length 34.1mm, width 43.2mm, thickness 7.1mm.
SF 10126, K 4405, topsoil, 1750+.

BELLS (Fig 2.11)

2.121 Small bell
Simple conical form with a suspension loop and three incised lines around the body. The clapper is missing and the side is slightly damaged.
Copper alloy. Height 16.9mm, diameter 13.0mm.
SF 4636, D 667, dump deposit of industrial waste, 175–250.

2.122 Small bell
Simple conical shape with suspension loop. The lower part of the bell is separated from the upper by a pronounced ridge. The clapper is lost and a small section of the flanged bottom is missing.
Copper alloy. Height 30.5mm, diameter 17.2mm.
SF 6021, C 24, robber spoil, 1750+.

2.123 Bell
A plain, triangular shape, surmounted by a round terminal pierced by a hole for the clapper/suspension loop which is missing. Squashed flat.
Copper alloy. Height 32.6mm, diameter 33.0mm.
SF 8243, F 3073, fill of robber-trench for north wall of the Large Basilica, 1750+.

2.124 Bell
Simple beehive shape with two slight incised lines around the body and suspension loop cast as one. The iron clapper is preserved.
Copper alloy. Height 31.6mm, diameter 30.0mm.
SF 6637, C 4148, dump deposit, 300–350.

2.125 Bell
Conical shape, decorated with three incised lines, two near the bottom and the other close to the junction with the large suspension loop, cast as one with the body. There is no hole at the top but instead a small hole at the top of the body must have held the clapper. The body is squashed and the side slightly damaged. The clapper is missing. Possibly post-medieval.
Copper alloy. Height 42.2mm, diameter (distorted) 31.0mm.
SF 80, C 48, roughly cobbled surface, 1750+.

TOOLS USED FOR AGRICULTURE, WOOD AND LEATHER WORKING

AGRICULTURAL IMPLEMENTS (Fig 2.12)

2.126 Billhook
A sweeping, thick blade with a rectangular cutting edge on the back of the head. The socket is open with no sign of nail holes to secure the instrument to the haft, presumably obscured by corrosion.

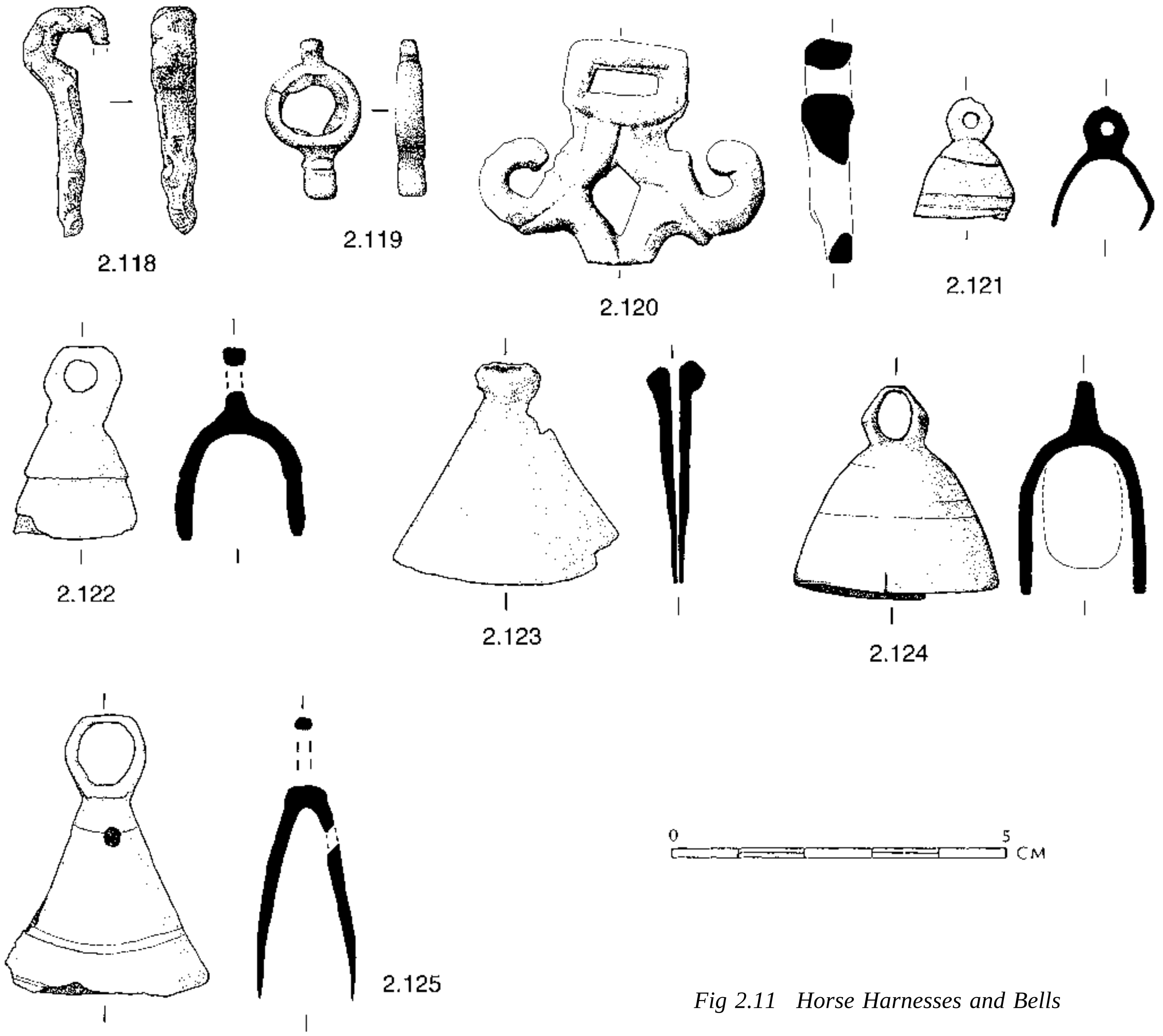


Fig 2.11 Horse Harnesses and Bells

Iron. Length 285.0mm, diameter of socket 24.1mm.
SF 5267, A 2235, within the collapsed remains of an oven, 450–600.

2.127 Small hook or billhook
The flat, tapering blade has a rectangular cutting edge on the back and a sharply turned, hooked end. Only tip survives. Heavily corroded.
Iron. Length 88.8mm.
SF 4682, D 677, fill of Roman ditch, 175–250.

LEATHERWORKING IMPLEMENTS (Fig 2.12)

2.128 Awl?
Bent tang, rounded short stem, flaring slightly before the point.
Iron. Length 112mm.
SF 6046, C 98, soil deposit, undated.

2.129 Punch?
Broken tang, rounded stem, narrowing to form the point.
Iron. Length 75.2mm.
SF 5036, A 2014, occupation surface, 450–600.

2.130 Punch?
Rectangular stem. Point broken.
Iron. Length 62.4mm.
SF 4528, D 621, clay floor of the 'early building', 350–450.

2.131 Punch?
Rectangular sectioned instrument with the shaft tapering to a blunt point and with a sharp, right-angled turn at the top, possibly where it emerged from a handle.
Iron. Length 106.4mm.
SF 5117, A 2118, backfill in the late Roman defensive ditch, *c* 450.

METALWORKING TOOLS (Fig 2.12)

2.132 Punch?
Domed head and circular sectioned, tapering stem, ending in a blunt point.

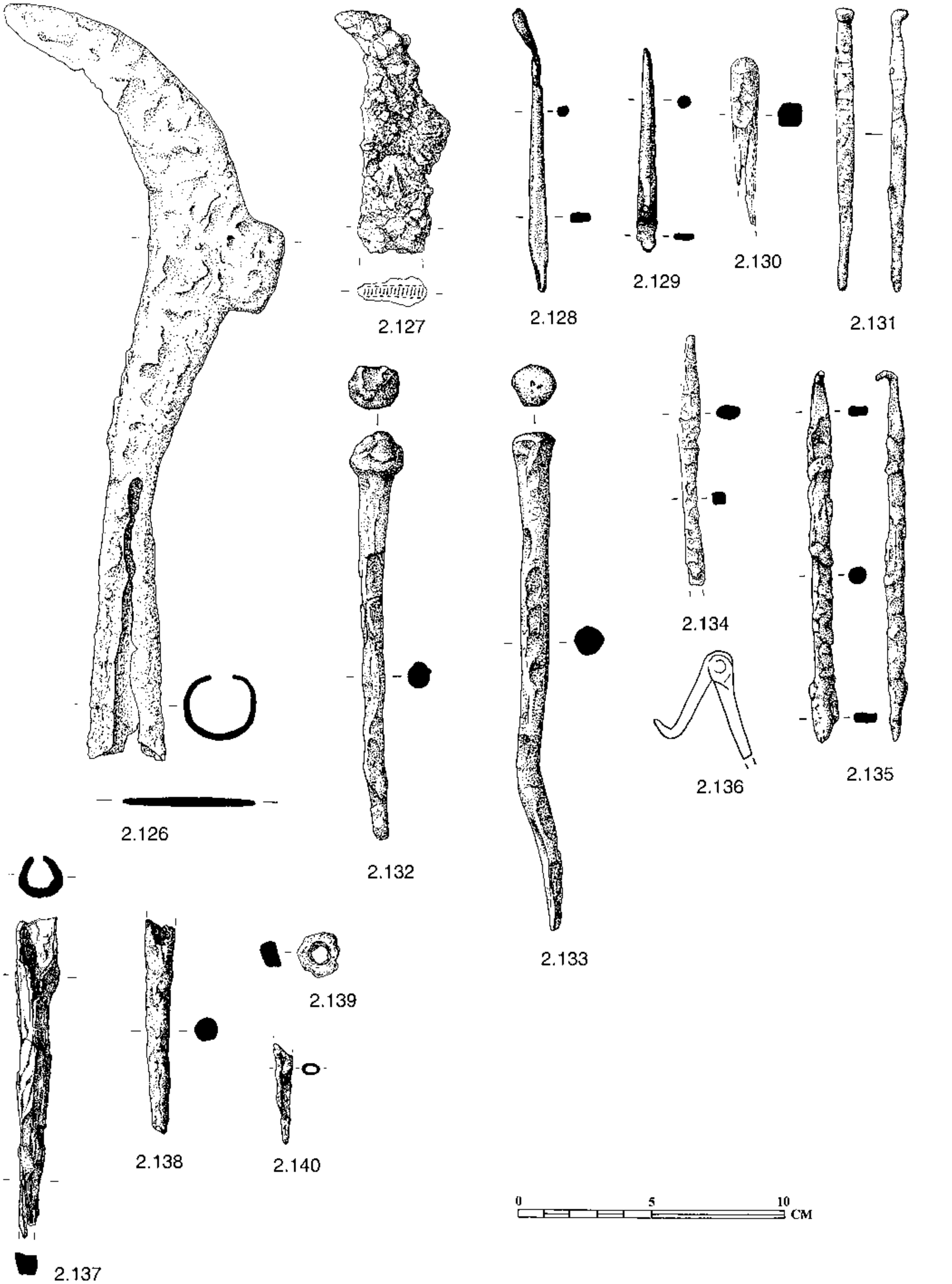


Fig 2.12 Agricultural Implements and Tools

Iron. Length 153mm.
SF 5085, A 2065, rubble spread, undated.

2.133 Punch
Flat head and tapering circular stem.
Iron. Length 195mm.
SF 10091, K 4439, robber-trench fill, 1750+.

WOOD-WORKING TOOLS (Fig 2.12)

2.134 Drill bit or punch
Square stem with triangular, square sectioned tang. Shaft incomplete.
Iron. Length 90.6mm.
SF 13040, R 5218, make-up deposit laid during construction of the tower, 450–500.

2.135 Awl
Circular shaft with a tapering, rectangular-sectioned tang.
Iron. Length 138mm.
SF 10055, K 4405, topsoil, 1750+

MISCELLANEOUS (Fig 2.12)

2.136 Dividers
Arms broken, rectangular in section, joined by a simple pin. (The drawing is of the x-ray).
Iron. Length 50.2mm.
SF 4655, D 676, ditch fill, 175–250.

2.137 Ferrule
Long tapering spike with a circular, open socket. Heavily corroded and tip missing.
Iron. Length 117.9mm.
SF 2556, B 250, cobble-spread, 300–400.

2.138 Ferrule
Possibly from a spear. Round-sectioned spike, broken socket and tip.
Iron. Length 79.1mm.
SF 13512, S 5263, floor make-up within the gate chamber, 450–600.

2.139 Ring?
Iron. Diameter 17mm.
SF 3179, E 1036, occupation surface, 450–600.

2.140 Ferrule
Distorted and squashed.
Copper alloy. Length 38.5mm.
SF 3240, E 1036, occupation surface, 450–600.

STUDS AND MOUNTS (Fig 2.13)

2.141 Stud
Decorated with three concentric grooves, two towards the centre, the other just inside the raised edge. Nail or rivet missing.
Copper alloy. Diameter 21.4mm.
SF 2150, B 243, secondary surface of cobbled road, 300–450.

2.142 Stud
Decorated with three concentric engraved circles. The shaft of the central rivet is missing.
Copper alloy. Diameter 28.5mm.
SF 12270, M 4911, collapsed remains of post-medieval building, 1750+.

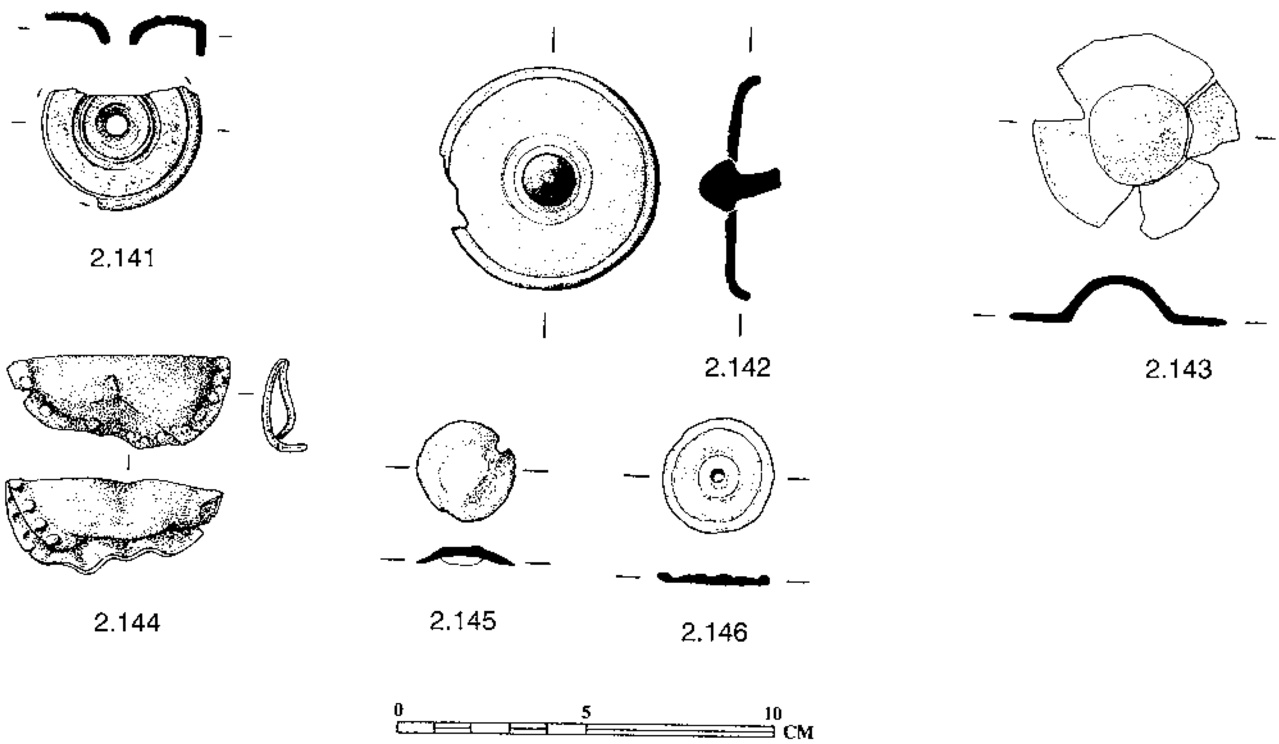


Fig 2.13 Studs and Mounts

2.143 Mount
Circular, domed and with a wide flanged rim. Sections of the rim damaged.
Copper alloy. Diameter 26.2mm.
SF 5200, A 2156, backfill of late Roman defensive ditch, 450–600.

2.144 Mount
A circular plate of metal with a slightly raised central surface, decorated around the rim with a line of closely spaced punch-marks. There are no holes for rivets or studs for attachment. Folded in half.
Copper alloy. Diameter 28.7mm.
SF 4712, D 699, fill of early rubbish pit, 130–150.

2.145 Mount
Circular boss, slightly damaged.
Copper alloy. Diameter 13.1mm.
SF 6610, C 4123, spread of domestic debris, 150–175.

2.146 Mount
Flat disk decorated with two circular grooves.
Copper alloy. Diameter 14.7mm.
SF 2600, B 299, backfill of the ditch cutting the Roman road, 250–350.

FITTINGS AND FASTENINGS (Fig 2.14)

2.147 Double-headed rivet
A domed head at one end and a flat plate at the other.
Copper alloy. Diameter of the domed head 12.9mm. Length 15.0mm.
SF 6457, C 4007, topsoil, 1750+.

2.148 Double-headed rivet
A domed head at one end and a flat plate at the other.
Copper alloy. Diameter of domed head 13.3mm. Length 14.4mm.
SF 4461, D 607, fill or rubbish pit, 400–450.

2.149 Ring-headed pin
A slightly distorted ring, the head pierced so the ring can move freely. The end of the shaft is broken.
Copper alloy. Length 46.0mm.
SF 2464, B 249, primary level of cobbled road surface, 300–450.

2.150 Clasp
This bent strip with flat head has one broken end.
Copper alloy. Length 9.0mm.
SF 6172, C 123, make-up deposit within the cobbled roadway, 300–450.

2.151 Fragment of fitting
A rectangular thin plate, probably cut (for scrap?) with central rivet hole.
Copper alloy. Length 26.4mm.
SF 6163, C 123, soil build-up over cobbled roadway, 300–450.

2.152 Riveted plate
A fragment of sheet metal with one round-headed split rivet, the shank of which passes through the plate and divides into two projections.
Copper alloy. Width 22.7mm.
SF 6322, C 130, secondary repair to cobbled road surface, 300–450.

2.153 Staple
Tapering ends. Bent.
Copper alloy. Length 17.5mm.
SF 10157, K 4463, post-medieval robbing debris, 1750+.

STRUCTURAL FITTINGS

DOUBLE-SPIKED LOOPS (Fig 2.14)

2.154 Double-spiked loop
Both spikes are broken.
Iron. Length 37.0mm.
SF 12049, M 4826, dump layer, 350–450.

2.155 Double-spiked loop
The spikes are broken.
Iron. Length 42.4mm.
SF 6204, C 133, soil accumulation over the cobbled road, 300–450.

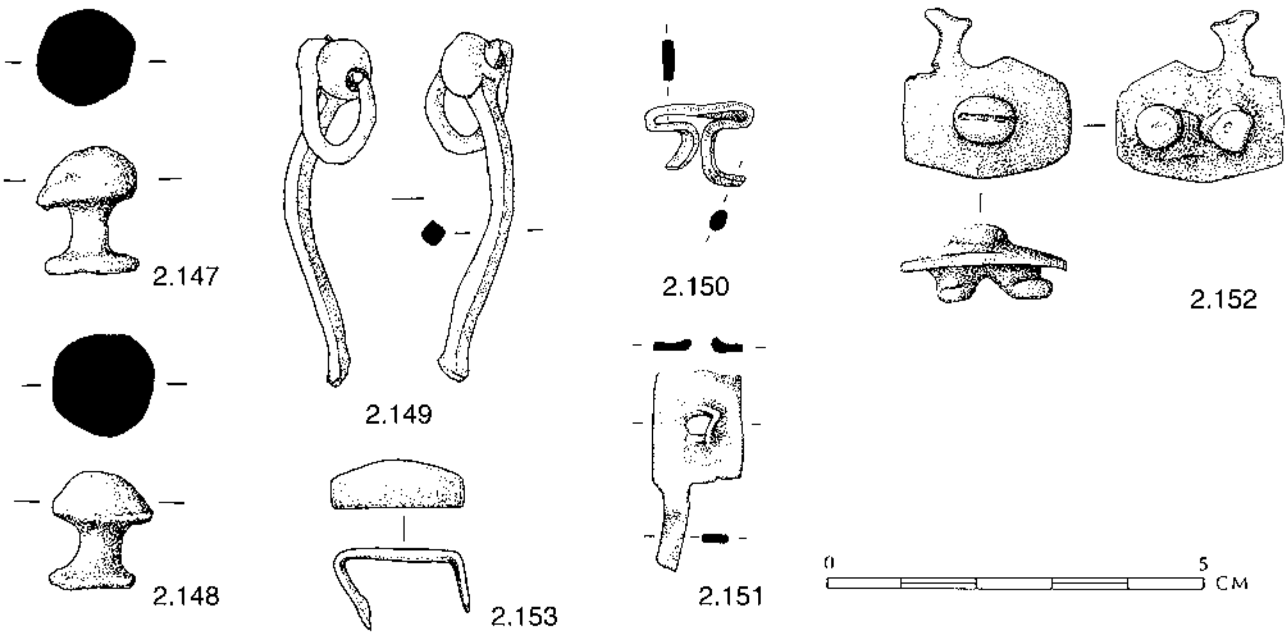
2.156 Double-spiked loop
The spikes are broken.
Iron. Length 41.3mm.
SF 2212, B 244, the cobbled road-surface, 300–450.

2.157 Double-spiked loop
The spikes are broken.
Iron. Length 63.7mm.
SF 4383, D 562, clay floor surface, 350–450.

2.158 Double-spiked loop
Both spikes are broken.
Iron. Length 68.9mm.
SF 6598, C 4121, dump deposit, 250–350.

2.159 Double-spiked loop
The spikes are broken.
Iron. Length 112.4mm.
SF 7260, F 3045, fill of robber-trench, 1750+.

2.160 Double-spiked loop
One spike complete.
Iron. Length 88.8mm.
SF 7479, F 3078, destruction rubble within the basilica’s narthex, 1750+.
NB. In the excavation report, it was stated that this came from robber-trench 3070, following the foundation for the west wall of the nave (Poulter 1995, 162, note 23). It may indeed have come from the top fill of this cut but the on-site log (but not the small-finds card) indicates that it came from robber spoil within the narthex. At any event, the floor of the narthex had been destroyed by post-medieval disturbance or robbing so the context date remains post-medieval.



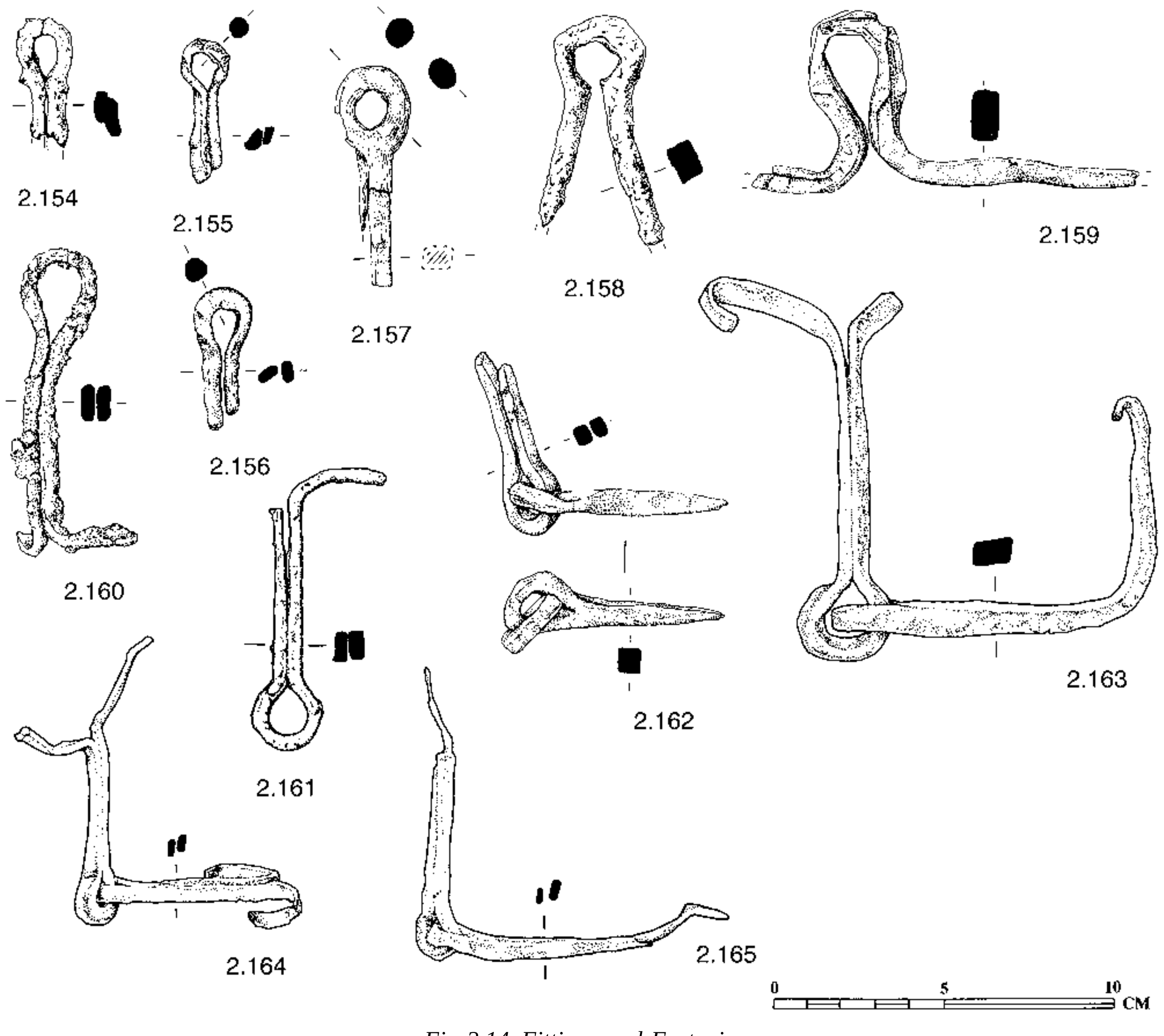


Fig 2.14 Fittings and Fastenings

2.161 Double-spiked loop
One spike complete.
Iron. Length 82.0mm.
SF 8065, F 3062, fill of post-medieval grubenhaus (3063), 1750+.

INTERLINKED DOUBLE-SPIKED LOOPS (Fig. 2.14)

2.162 Interlinked double-spiked loops
Spikes broken.
Iron. Length 112.0mm.
SF 7403, F 3032, destruction deposit over the floor of the basilica, 450–600.

2.163 Interlinked double-spiked loops.
One spike undamaged.
Iron. Length 195mm.
SF 14049, M, u/s

2.164 Interlinked double-spiked loops
Iron. Length 126.1mm.
SF 7520, F 3078, destruction rubble within the narthex, 1750+.

2.165 Interlinked double-spiked loops
Spikes broken.
Iron. Length 145.0mm.
SF 7521, F 3078, destruction rubble within the narthex, 1750+.

LOOP-HEADED SPIKE AND RING (Fig 2.15)

2.166 Loop-headed spike
The spike is broken.
Iron. Length 57.0mm. Internal diameter of ring 24mm.
SF 12342, M 4942, pit-fill, 350–450.

The double-spiked loops from the Large Basilica in area F are of particular interest. Although only one (2.162) was stratified within the 6th century destruction deposit, five others (2.159, 2.160, 2.161, 2.164 and 2.165) came from the area. It is quite likely that all these double-spiked loops were parts of 'hinges', perhaps used for fixing wooden shutters to the windows of the basilica (Poulter 1995, 162). Double-spiked loops are common finds in the region (*Novaensia* I, tab. V, 1–5).

HOOKS (Fig 2.15)

2.167 Hook
Iron. Length 72.5mm.
SF 6137, C 121, cobbled road surface, 300–450.

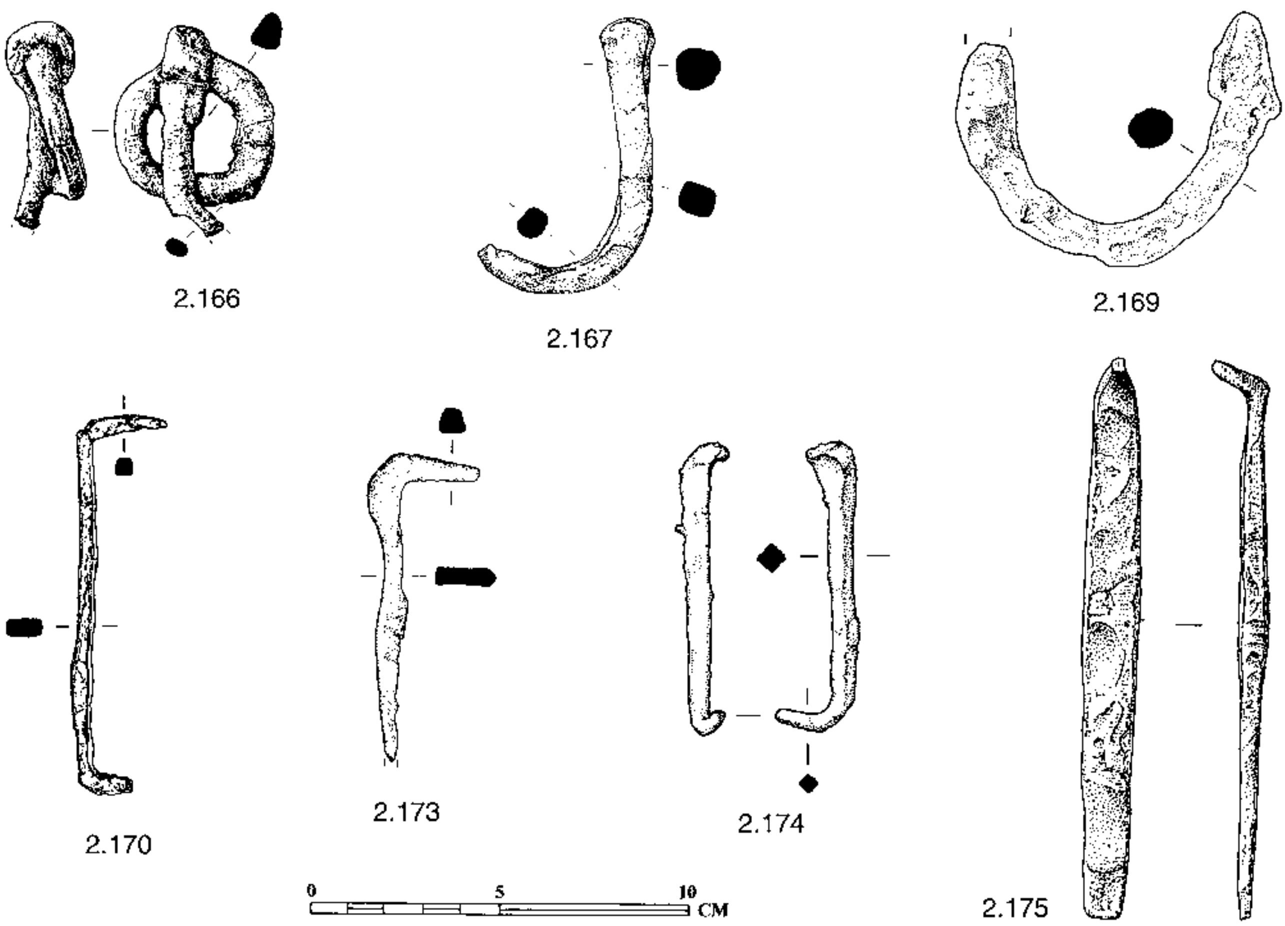


Fig 2.15 Loop-Headed Spike, Hooks and Clamps

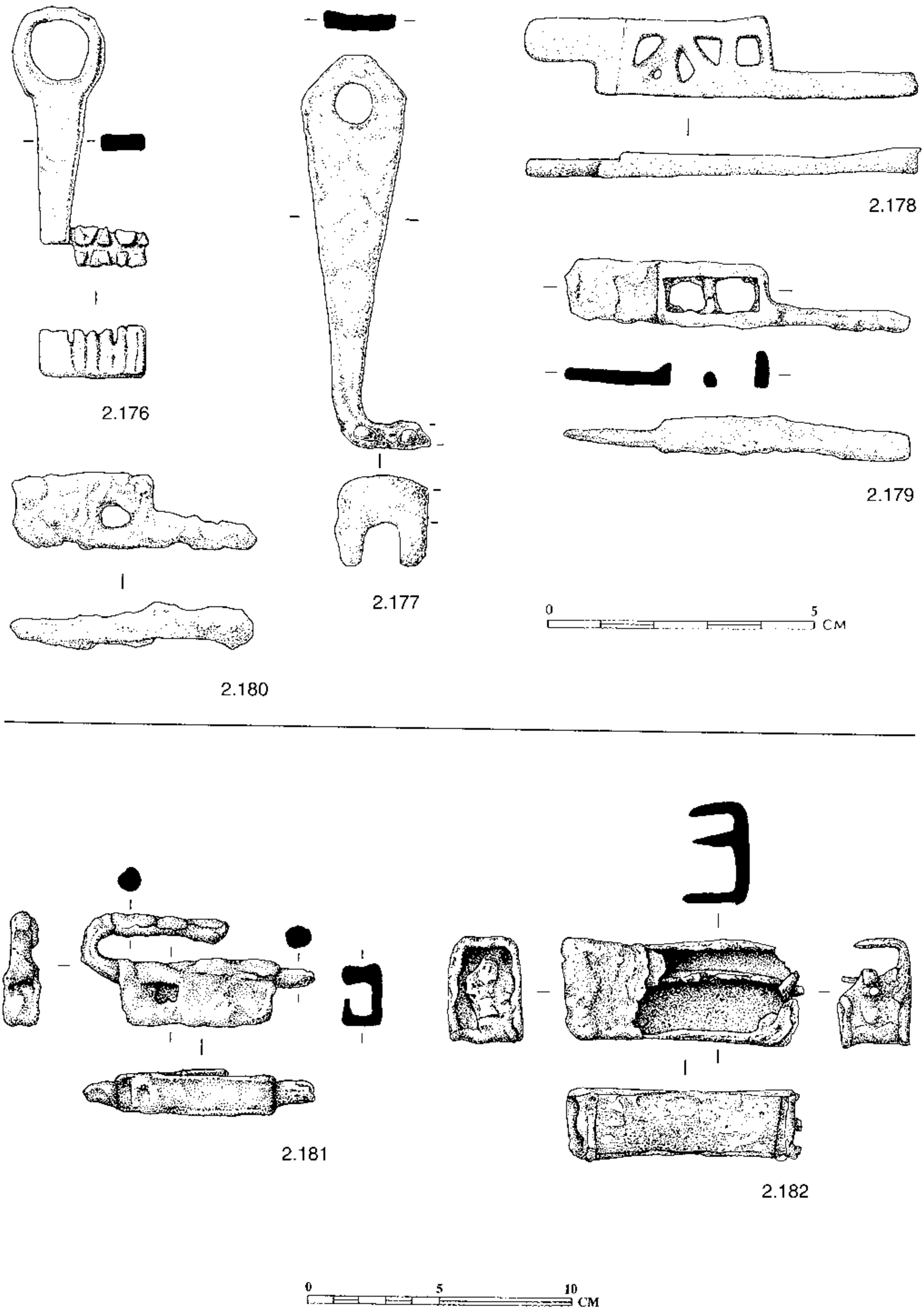


Fig 2.16 Keys and Locks

2.168 Small hook
Iron. Length 39.0mm. Not illustrated.
SF 2396, B 249, bottom of cobbled road surface, 300–450.

2.169 Wallhook with terminal knob
Point missing.
Iron. Length 85.0mm.
SF 2675, B 264, pit-fill, 100–130.

2.170 L-shaped wallhook
Rectangular shaft. Not illustrated.
Iron. Length 54.8mm.
SF 4243, D 491, destruction deposit over the floor in the 'workshops', 450–600.

T-CLAMP

2.171 T-clamp
Head only survives. Not illustrated.
Iron. Width of head 50mm.
SF 6488, C 4013, backfill of late Roman ditch, *c* 450.

CLAMPS/ JOINER'S DOGS (Fig 2.15)

2.172 Clamp probably for joining masonry blocks
Iron. Length 98.4mm.
SF 8166, F 3288, make-up deposit, 400–450.

2.173 Joiner's dog or masonry clamp
Although the back is of rectangular, almost flat section, which suggests a masonry clamp, the single surviving end tapers towards a point which is more appropriate for a joiner's dog.
Iron. Length 80mm.
SF 10147, K 4479, robbing debris, 1750+.

2.174 Joiner's dog
One point broken.
Iron. Length 72.8mm.
SF 3151, M, u/s.

2.175 Joiner's dog
The surviving end tapers towards the point. The other is missing.
Iron. Length 145mm.
SF 6426, C 130, cobbled road surface, 300–450.

KEYS AND LOCKS (Fig 2.16–2.18)

2.176 Tumbler lock slide key
The eight teeth are arranged in pairs. A central cut was made at right angles across the width of the bit whereas two others, one to the left and the other to right, were incised diagonally giving the teeth a pronounced triangular shape. The handle ends in a suspension loop.
Copper alloy. Length 48.3mm, width 22.0mm.
SF 2031, B 219, cobbled road surface, 300–450.

2.177 Tumbler lock slide key
The straight bit has two simple rectangular teeth surviving. The handle, tapering towards the bit, has a central suspension hole at its other end. Only the first section of the bit survives.
Iron. Length 72.5mm.
SF 8315, F 3353, dump deposit, 400–450.

2.178 Lock-bolt from a tumbler lock
It has square, half-moon and two triangular holes.
Copper-alloy. Length 74.2mm.
SF 5310, A 2328, silty clay deposit beneath clay floor of Roman house, 100–130.

2.179 Lock-bolt from a tumbler lock
Two simple rectangular holes in a box shaped surround and with a flat plate at the end.
Iron. Length 64.0mm.
SF 4380, D 563, topsoil, 1750+.

2.180 Lock-bolt from a tumbler lock?
Heavily corroded but with one roughly rectangular hole visible.
Iron. Length 45.1mm.
SF 10119, K 4462, rubble layer, 1750+.

2.181 Barb-spring padlock case
The case was probably made in the same way as 2.182, although part of the top is lost and corrosion obscures the edges of the plates (Figs 2.16 and 2.17). The keyhole takes the form of a square hole near the back of one side. The curve and part of the stem of the hasp-rod survives, curving up from the back of the top of the case to run forward above it. An X-ray photograph shows that the end of this rod continues into the case where it is thinned to form a wide spring which lay below the bolt. This spring slopes down from the top of the case before curving back on itself to end in a tightly rolled tip.

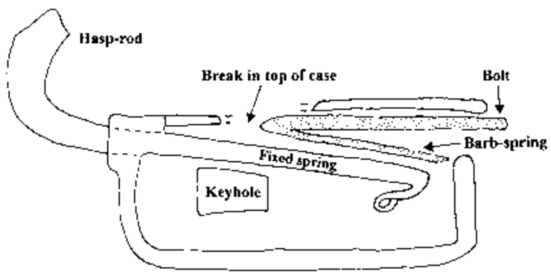


Fig 2.17 Barb-spring Padlock (2.181)

The bolt was inserted through a hole at the top of the front of the case. Much of it remains in place, although its haft, which will have turned up through a right angle to end in a loop which slipped over the hasp-rod, is almost entirely lost. The X-ray photograph shows that the bolt extended for some two-thirds of the length of the case, and had a single barb-spring below it, which was attached, probably by welding, to the tip of the bolt.

To close the lock the bolt will have been pushed in through the bolt-hole, the barb-spring contracting as it passed through the hole before springing out to secure the bolt once it was inside the lock. It was opened by inserting the key in the keyhole and then sliding it forward to push

up the fixed spring; this, in turn, will have compressed the barb-spring and allowed the bolt to be withdrawn.

The mechanism of this and the following lock (2.182) are variants of a basic type of barb-spring padlock which first appears in the Roman period and which still remains in use today in various forms. (W. H. Manning).
Iron. Length 74mm, length of case 55mm, width 14mm, 26mm.
SF 6017, C 74, rough stone surface, 1750+.

2.182 Barb-Spring Padlock Case
The case is made from two rectangular sheets of iron, the larger being bent through two right angles to form the top and two sides; the smaller, which was long and thin, was bent to form the front, base and back (Figs 2.16 and 2.18). The hasp-rod is missing. At the back of the case is a

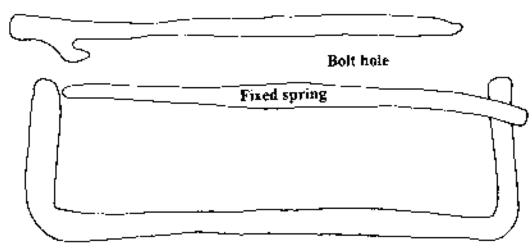


Fig 2.18 Barb-spring Padlock (2.182)

vertical slit which extends for the full height of the case and for about one-third of its width. This is probably the keyhole, although it has probably been enlarged by corrosion and originally may have been a square hole in the lower corner. Some two-thirds of one side of the case is missing to reveal a thin iron strip which runs for the full length and width of the case. At the front it narrows into a small rod which runs through the front plate of the case to hold the plate in place. An X-ray photograph shows that the other end of the plate is not attached to the case and it can be identified as a fixed spring similar to that seen in. 2.181. The slit-like bolt-hole runs across the front of the case above the fixed end of this spring.

Although there are differences in design between this and the other padlock (No. 2.181), the mechanism was similar, with the key pushing up the fixed spring to compress the barb-spring on the bolt (W. H. Manning).
Iron. Length 88mm, width 28mm, height 39mm.
SF 1112, C 24, robber spoil, 1750+

MILITARY EQUIPMENT

RING-MAIL (Fig 2.19)

2.183 Ring mail
The fragment is folded in two. The rings, 7mm in diameter, are made from wire of rounded section (2mm in diameter). No rivets are visible, no doubt due to the high degree of corrosion. Each complete ring interlocks with two above and two below.
Iron. Length 62 mm.
SF 6671, C 4215, soil accumulation and destruction deposit, immediately over cobbled road, *c* 450.

SCALE ARMOUR (Fig 2.19)

Scrap, collected for recycling, included fragments of *lorica squamata*. The dump make-up, comprising material probably brought from the last occupation level in the late Roman city and used as make-up within the early Byzantine tower (P 5018/5051), includes, in addition to other copper-alloy items intended for recycling, scales of armour (below 2.184 and 2.186) as well as two other possible examples, neither sufficiently preserved to allow positive identification (SF 14221 and SF 14665). In addition to the find noted below (2.185), the same backfill deposit within the west/east ditch in area B (dated 250/275) produced two other fragments which may been from *lorica squamata* (SF 2644, SF 2637) although these finds were too fragmentary to be certain.

2.184 Two scales of *lorica squamata*
One almost complete scale with curved lower edge is attached to a second which has been clipped, no doubt because they were both intended for recycling as scrap. The well-preserved example is 24.4mm in length, 18.8 mm wide and 0.8 mm thick. The holes for attachment to adjacent scales are each 1.8mm in diameter. The larger hole, for sewing to the undergarment is 4.0mm in diameter. The complete scale is slightly convex in horizontal section. The strip of copper alloy, used to join the two scales, is 0.9mm thick and 1.7mm wide. Slight traces of what seems to be white metal plating are visible on both scales. However X-ray fluorescence proved inconclusive. Possibly the scales were not plated but .the apparent tinning may be explained by the presence of tin or lead in the alloy. X-ray fluorescence and XRF analysis were carried out by The Ancient Monuments Laboratory. The alloy is of zinc and brass with minor quantities of lead and tin (Lab. No. 9, 1990).
SF 14194, P 5018, dump deposit, *c* 450.

2.185 Scale of *lorica squamata*
The plate is rectangular with a slightly convex longitudinal section and with a straight lower edge, slightly clipped on both sides. It is 31.1mm in length, 25.5mm wide and 0.8mm thick. Two pairs of holes are provided centrally on the top edge of the plate for attachment to the undergarment and pairs of holes have been punched towards the bottom on either side for attachment to adjacent scales. In each case, the holes are 2.5 mm in diameter.

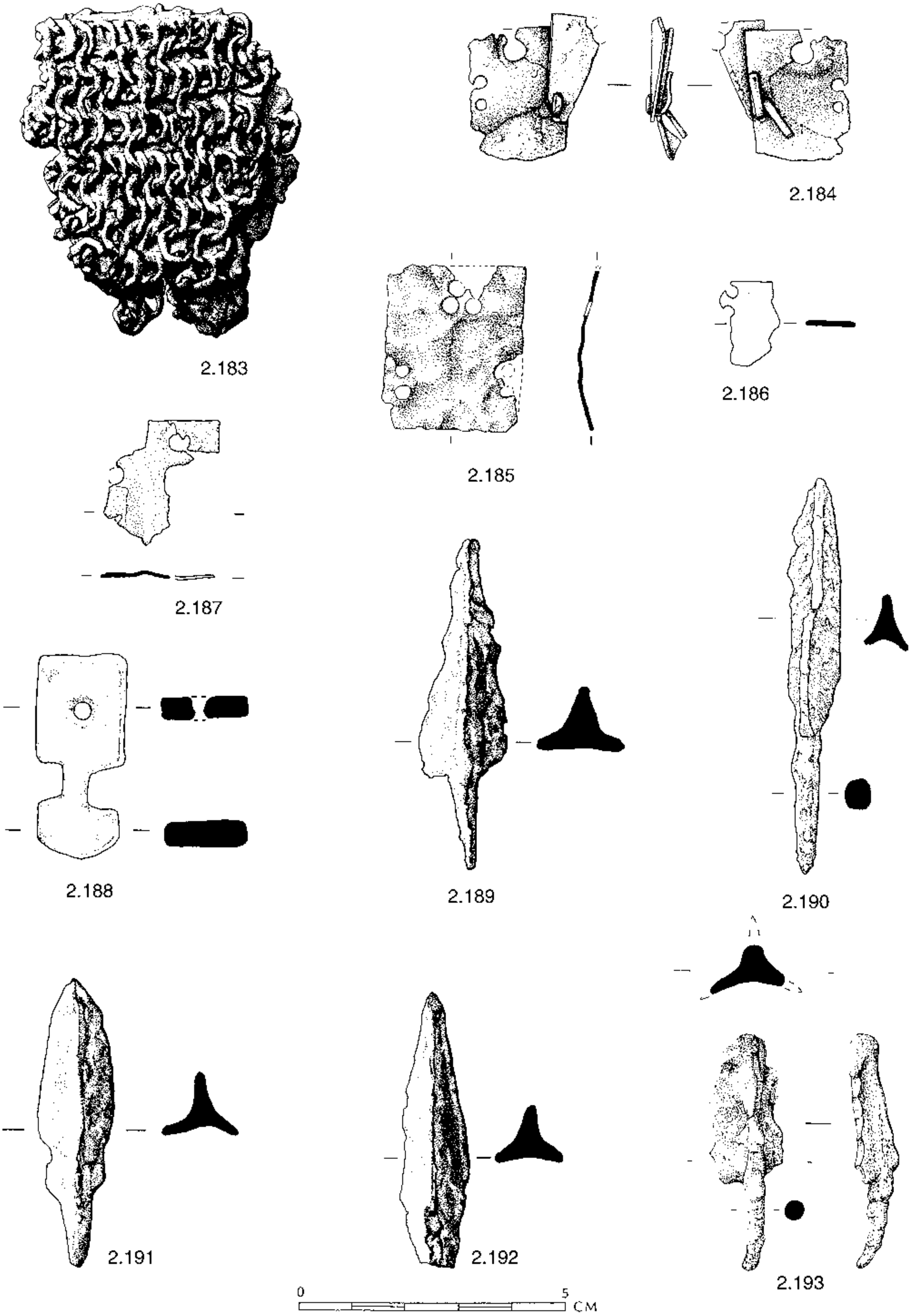


Fig 2.19 Armour and Arrowheads

Copper alloy.
SF 2648, B 288, primary silting in west/each ditch, 250–275.

2.186 Scale of *lorica squamata*
The left edge is broken and the right half missing. Two holes close to the top left edge for attachment to another scale. The plate is 1mm thick and is 16.3mm in length.
Copper alloy. Width 6.5mm.
SF 14216, P 5018, dump deposit, *c* 450.

2.187 scale of *lorica squamata*
Poorly preserved, distorted plate, 1 mm thick with a hole, 7mm in diameter, for attachment to an undergarment below the broken top edge. Two holes, 5mm in diameter close to the broken left edge, for attachment to an adjacent scale.
Copper-alloy. Preserved length 23.6mm and width 20mm.
SF 14268, P 5020, cultivation soil, 250–350.

2.188 Turning-pin for joining breast-plates?
A flat plate with a hole drilled through its body. Almost certainly used as a lock-pin or turning-pin to join two metal plates. This kind of fitting was used to join the small breast-plates attached to *lorica squamata*; Robinson 1975, 160–161. However, whether this was its function in this case remains uncertain.
Copper alloy. Length 36.5mm.
SF 2649, B 335, domestic waste dump within a ditch dug across the Roman road, 175–250.

ARROWHEADS (Fig 2.19)

2.189 Triple-ribbed arrowhead
The best-preserved of the three ribs projects slightly back from the head: perhaps it was barbed.
Iron. Length 61mm.
SF 14730, P 5030, destruction debris, 250–300.

2.190 Triple-ribbed arrowhead
Iron. Length 75mm.
SF 6430, C 126, cobbled roadway, 300–450.

2.191 Triple-ribbed arrowhead
Iron. Length 54mm.
SF 13522, S 5251, robber-trench, 1750+.

2.192 Triple-ribbed arrowhead
Tang missing.
Iron. Preserved length 51mm.
SF 15502, S 5272, cobbled roadway within gate chamber, 450–600.

2.193 Triple-ribbed arrowhead
Heavily corroded.
Iron. Length 43mm.
SF 3252, E 1025, robbing debris, 1750+.

2.194 Triple-ribbed arrowhead. Not illustrated.
Iron. Length 52mm.
SF 6669, C 4212, cobbled berm, 400–450.

CATAPULT BOLT-HEADS (Fig 2.20)

2.195 Bolt-head?
Pyramidal tapering head with a damaged, conical socket.
Iron. Length 61mm.
SF 1092, D 406, dump deposit, 400–600.

2.196 Bolt-head
Rectangular, tapering shaft.
Iron. Length 65.1mm.
SF 3248, R 1085, fill of drain beneath south gate of early Byzantine defences, 450–600.

2.197 Bolt-head?
Corroded with an apparently round-sectioned head and distorted socket. Not illustrated.
Iron. Length 58mm.
SF 6175, C 123, cobbled road, 300–450.

SPEARHEAD (Fig 2.20)

2.198 Spearhead
A narrow leaf-shaped blade with lenticular section and a partially closed socket, its end slightly damaged. Maximum width of the blade 40mm, length of blade 175mm, maximum external diameter of the socket 25mm.
Iron. Length 307mm.
SF 5214, A 2188, primary fill of destruction material in the late Roman defensive ditch, *c* 450.

CALTROP (Fig 2.20)

2.199 Caltrop
Two of the four spikes are broken. The complete spikes are both 28mm in length.
Iron. Length 50mm.
SF 13048, R 5218, make-up dump within the pentagonal tower, *c* 450.

POST-MEDIEVAL WEAPONS (Fig 2.21)

The village of Stari Nikiup was destroyed by fire. The discovery of weaponry in contexts associated with this event, which occurred in the late 18th or early 19th century, suggests that occupation did not end in a peaceable evacuation (Poulter 1995, 49–51). The solid cannon-balls are unlikely to date as late as the later 19th century, by which time high explosive shells were used for field-artillery. Metal-bodied grenades, filled with gunpowder and with a burning match serving as a simple fuse, were in use in Europe from the late 16th century. By the late 18th century, spherical artillery shells with a gunpowder bursting charge were employed in European warfare. The apertures of the grenades appear large enough to have accommodated plug fuses in use until well into the 19th century. Given these were found in close association with two of the cannon-balls, it is therefore possible that they were fired from cannon and not thrown by hand (pers comm Mr M.G. Hibberd, Dept. of Exhibits and Firearms, The Imperial War Museum, London).

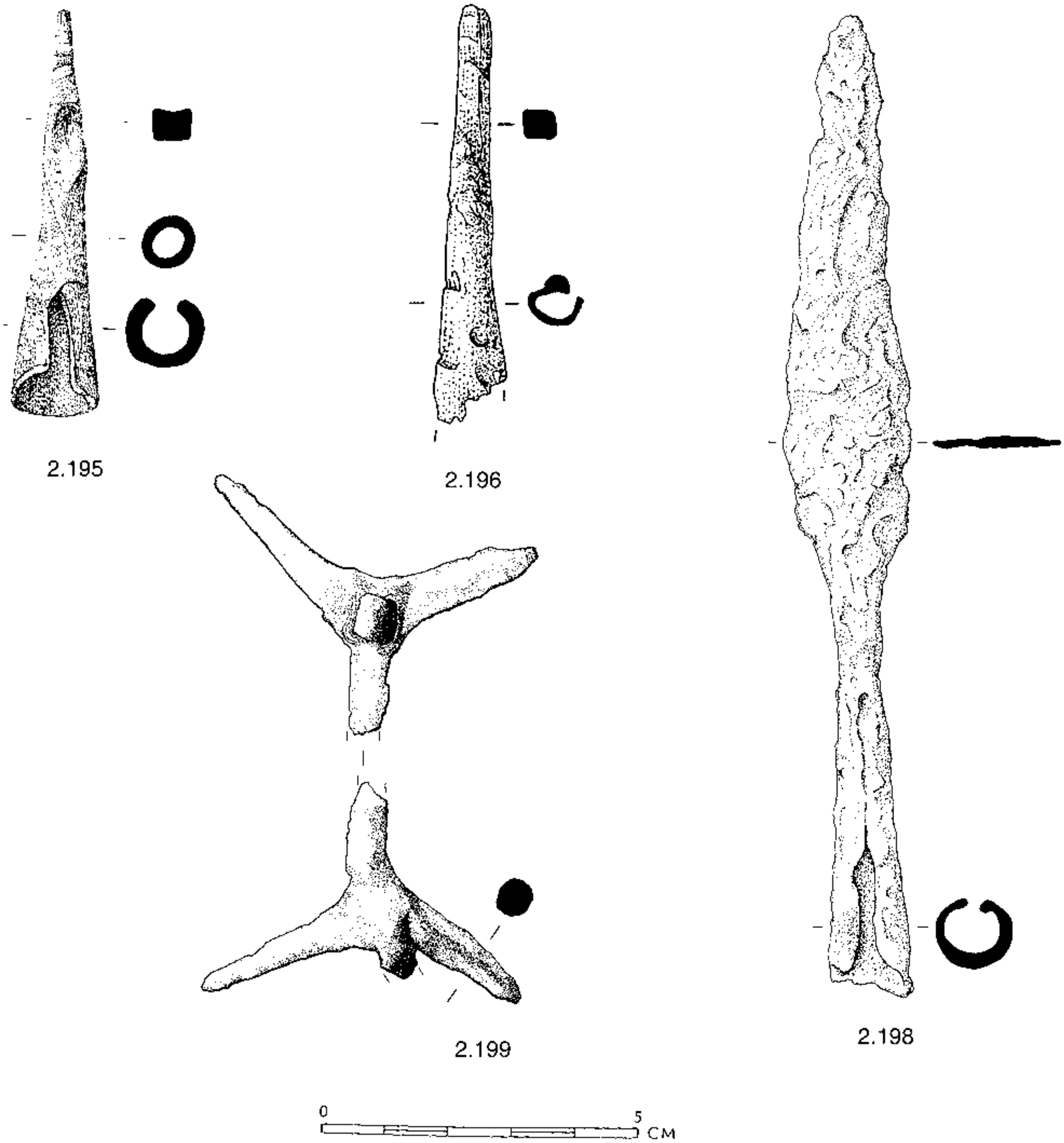


Fig 2.20 Catapult Bolt-heads, Spearhead and Caltrop

2.200 Cannon-ball
Cast from a single mould with a flat base. Weight 2.95kg.
Iron. Diameter 90mm.
SF 7358, F 3062, destruction level within a grubenhaus (3063), 1750+.

2.201 Cannon-ball
Cast from a single mould. Round profile. Weight 1.765kg.
Iron. Diameter 80mm.
SF 8048, F 3062, destruction level within a grubenhaus (3063), 1750+.

2.202 Cannon-ball
Cast from a single mould. Round profile. Weight 0.509kg.
Iron. Diameter 50.5mm.
SF 6642, C 4205, destruction debris within a grubenhaus (4208), 1750+.

2.203 Grenade
Hollow cast in a two-part mould. It has two holes, each 15mm in diameter, one at each end. The lower hole has been plugged and welded. The upper hole is open to take a fuse. Weight 0.95kg.
Iron. Diameter 70mm.
SF 7491, F 3126, on the floor of a grubenhaus (3063), 1750+.

2.204 Grenade
Hollow cast in a two-part mould. The body is

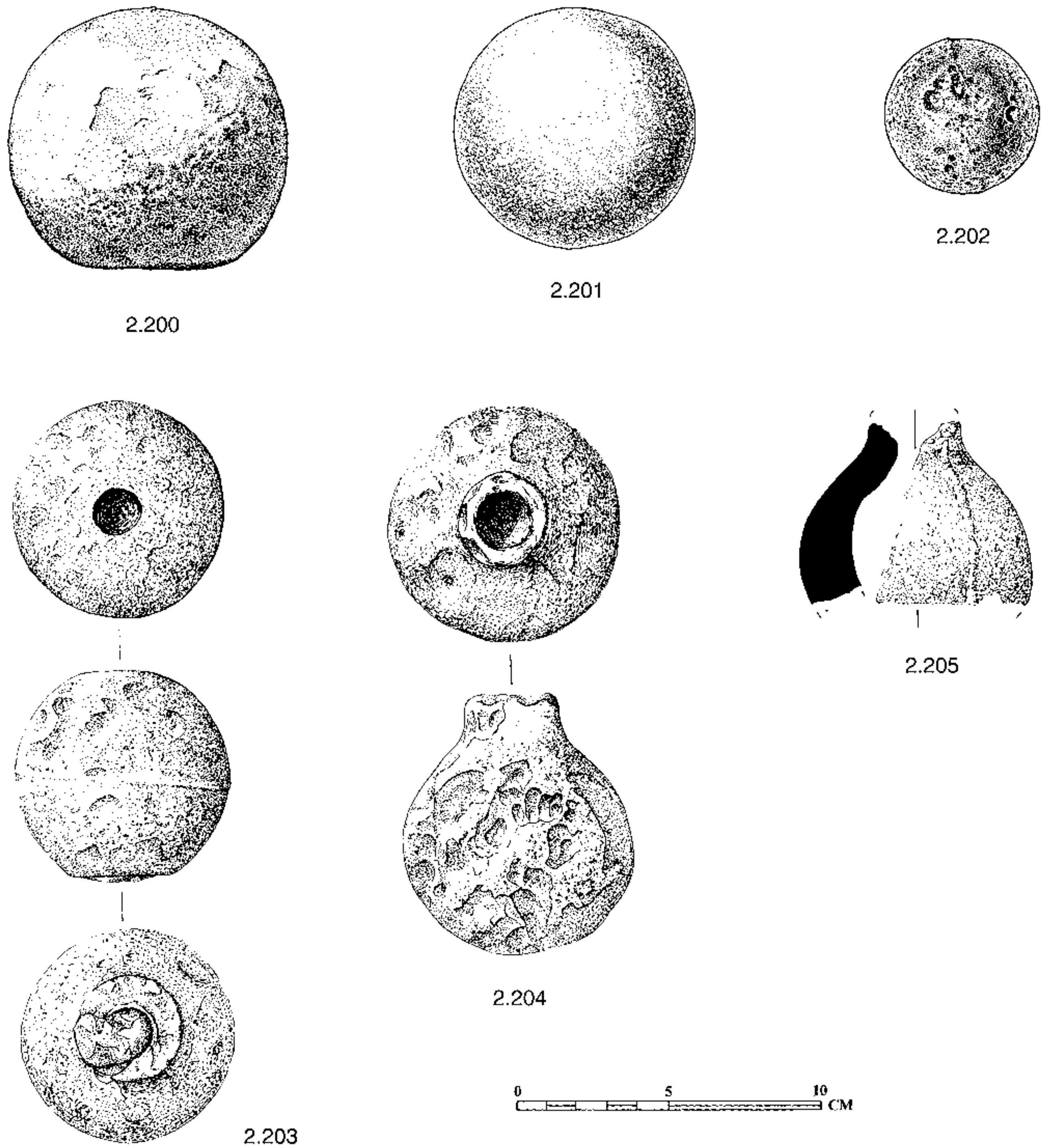


Fig 2.21 Post-medieval Weapons

round but has a projecting neck 31mm in external diameter with a central hole 17mm in diameter to take a fuse. Weight 1.125kg.
Iron. Diameter 75mm.
SF 8030, F 3119, the collapsed mud walls of a grubenhaus (3063), 1750+.

2.205 Grenade fragment
Apparently exploded. Hollow cast in a two-part mould. Approximately one quarter preserved with the bottom of a projecting neck. Similar in size and form to 2.204.
Iron. Diameter 74mm.
SF 7490, F 3126, on the floor of a grubenhaus (3063), 1750+.

RINGS (Figs 2.22 and 2. 23)

2.206 Suspension loop
D-shaped, made from round-sectioned wire. Probably the end of a small chain.
Copper alloy. Length 12.3mm.
SF 14612, P 5050, destruction deposit from the Roman city used as backfill, *c* 450.

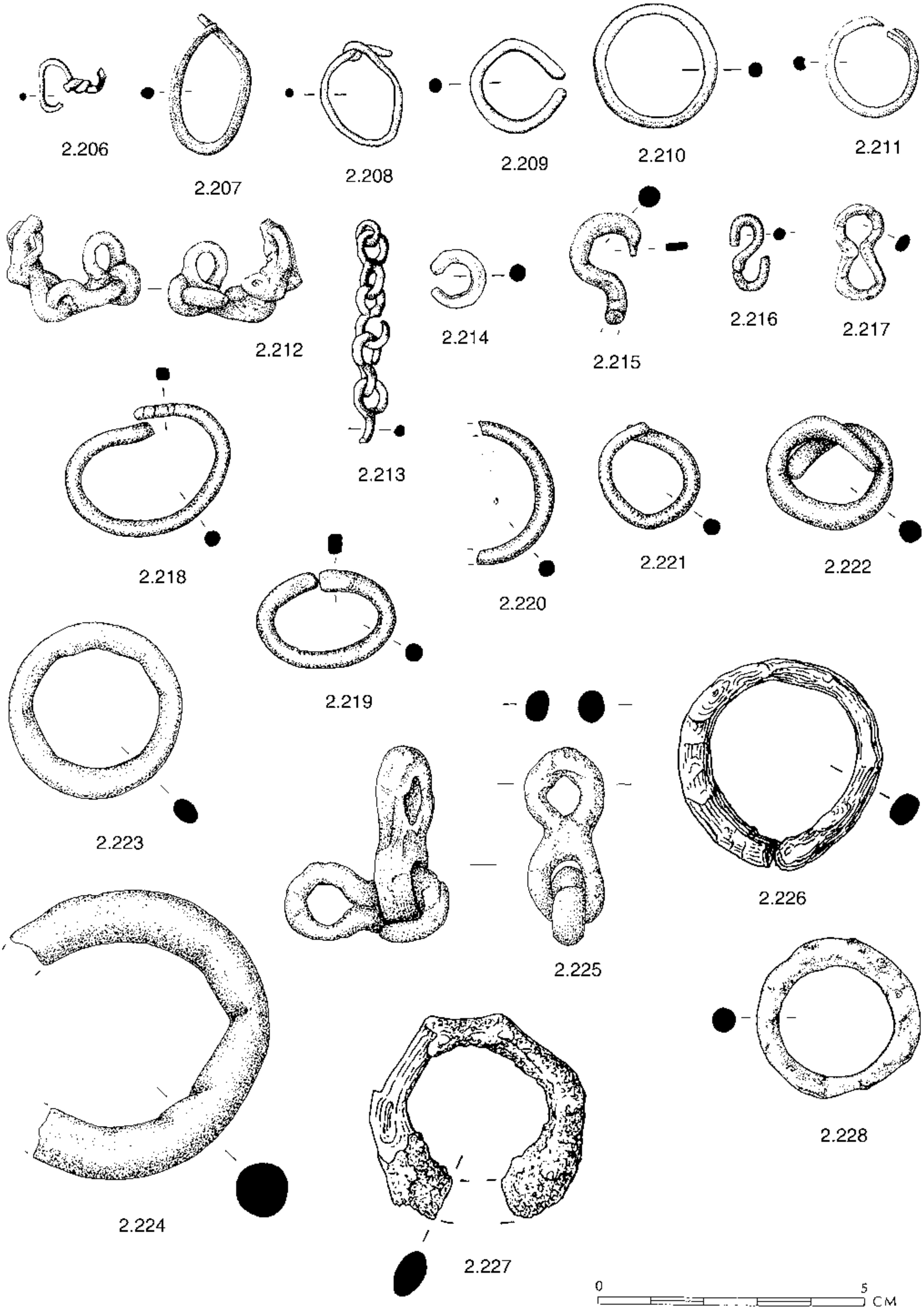


Fig 2.22 Rings

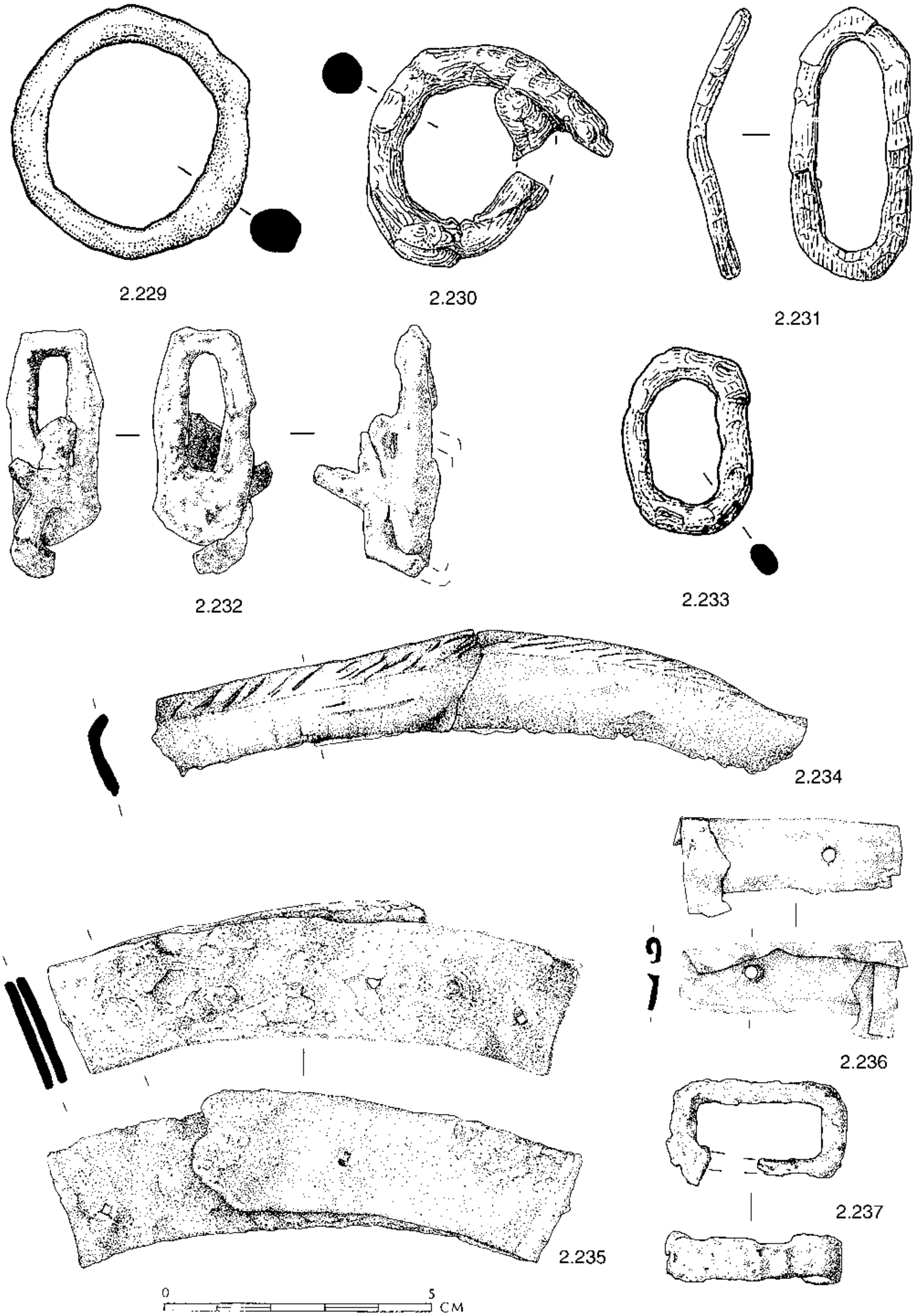


Fig 2.23 Rings, Bindings and Edgings

2.207 Loop
A length of wire with tapering ends bent into an oval shape. Possibly an earring.
Copper alloy. Thickness (max) 1.8mm, internal diameter 21.3 and 16.2mm.
SF 2165, B 243, secondary layer of cobbled roadway, 300–450.

2.208 Ring
A length of wire with one end crudely wrapped over the other to form a roughly circular ring.
Copper alloy. Internal diameter (max) 15.1mm.
SF 4379, D 558, destruction deposit within the 'early building', 350–450.

2.209 Link
Sturdy loop of round profile, slightly distorted.
Copper alloy. Thickness 2.0mm, internal diameter 12.6mm.
SF13013, R 5209, robber-trench fill, 1750+.

2.210 Ring
Circular profile.
Copper alloy. Thickness 2.6mm, internal diameter 19.2mm.
SF 14164, P 5018, dump deposit from destruction level covering the Roman city, used in the construction of the tower, *c* 450.

2.211 Ring
A strip of metal with the sides rolled over to form a ring of roughly oval section. Slightly distorted and the ends squashed flat. Possibly a finger ring.
Copper alloy. Thickness 2.0mm, internal diameter 17.0mm.
SF 6444, C 4006, topsoil, 1750+.

2.212 Chain
Four interlocking figure-of-eight links. Corroded.
Copper alloy. Length of best-preserved end link 15.4mm. Overall width of the fragment 24.3mm.
SF 7171, F 3047, robber-trench fill, 1750+.

2.213 Chain
Length of chain comprising 4 figure-of-eight links with a single ring at one end, broken at the other. Three of the links distorted.
Copper alloy. Length of each figure-of-eight link 12.4mm. Overall length 42.5mm.
SF 12279, M 4915, dump/accumulation layer, 350–450.

2.214 Ring
A small ring of circular section. Probably from a small chain. Distorted.
Copper alloy. Internal diameter 5.0mm.
SF 6594, C 4107, primary make-up for the berm of the Roman defences, 250–350.

2.215 Link?
A fragment of sturdy, round-sectioned metal, broken at one end and apparently flattened at the other. Possibly a small hook.
Copper alloy. Length 21.4mm.
SF 6485, C 4013, dump deposit backfilling the late Roman defensive ditch, *c* 450.

2.216 Figure-of-eight link
Copper alloy. Length 13.7mm.
SF 6347, C 130, cobbled roadway, 300–450.

2.217 Figure-of-eight link.
Iron. Length 35.9mm.
SF 2694, B 336, fill of ditch cutting the Roman road, 175–250.

2.218 Loop
A simple oval loop of circular section. The ends simply overlap.
Copper alloy. Internal diameter (max) 27.7mm.
SF 5008, A 2017, berm of the Roman defences, 450.

2.219 Link
Oval in shape with butt-jointed ends and of round section.
Copper alloy. Internal diameter (max.) 20.5mm.
SF 6326, C 130, secondary surface of cobbled roadway, 300–450.

2.220 Ring
Round loop of round section. Half preserved.
Copper alloy. Internal diameter 25.4mm.
SF 3256, E 1087, water-born silt within the drain beneath the early Byzantine south gate, 450–600.

2.221 Link
Roughly circular form and of circular section with overlapping ends.
Copper alloy. Internal diameter (max) 19.3mm.
SF 4455, D 604, destruction deposit within the 'early building,' 350–450.

2.222 Loop
Roughly circular in form and of circular section with overlapping ends. Probably link from a chain.
Copper alloy. Internal diameter (max)16.9mm.
SF 4495, D 573, floor level within the 'workshops', 450–600.

2.223 Ring
Round in shape and oval-sectioned, varying in thickness. Possibly a buckle or part of horse harness.
Copper alloy. Thickness (max) 6.1mm, thickness (min) 4.7mm. Internal diameter 23.8mm.
SF 4338, D 537, silty build-up and dump material, 350–450.

2.224 Ring
Thick, round-sectioned length of metal, bent, with some difficulty, to produce a round shape. One third missing.
Copper alloy. Thickness 10.4mm, internal diameter 35.5mm.
SF 6242, C 129, secondary cobbling on the roadway, 300–450.

2.225 Two connected figure-of-eight links
Iron. Length 59.0mm.
SF 3071, E 1036, occupation surface, 450–600.

2.226 Ring
Iron. Internal diameter 28mm.
SF 6165, C 121, cobbled road surface, 300–450.

2.227 Ring
Iron. Internal diameter 27mm.
SF 2617, B 280, fill of Roman ditch cutting the road, 250–350.

2.228 Ring
Iron. Internal diameter 21mm.
SF 8185, F 3292, clay make-up for a floor, 400–450.

2.229 Ring
Iron. Internal diameter 34mm.
SF 2326, B 247, cobbled road, 300–450.

2.230 Ring
Iron. Internal diameter 26mm.
SF 4328, D 542, occupation level, 450–600.

2.231 Loop
Iron. Length 51mm.
SF 5153, A 2135, backfill of late Roman ditch, 450–600.

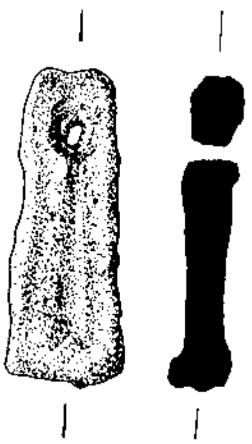
2.232 Loop
Attached to part of a second interlinked loop with a protruding short stem.
Iron. Length 44mm.
SF 8183, F 3292, clay make-up for a floor, 400–450.

2.233 Ring
Iron. Internal diameter 22.5mm.
SF 5124, A 2126, fill of late Roman ditch, 450–600.

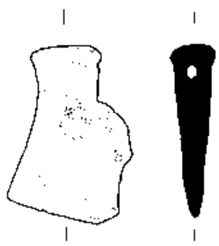
BINDINGS AND EDGINGS (Fig 2.23)

2.234 Edging
Two pieces of plate which join. Although one (2003) comes from a post-medieval context, it must be residual since the other (2010) is certainly late Roman. The plate comprises a plain broad flange with a down-turned edge which is decorated by diagonal incisions.
Copper alloy. Length 121.0mm, width of flange 14.3mm, width of edge 6.1mm.
SF 2010 (left), B 211, upper layer of cobbles on road surface, 300–450.
SF 2003 (right), B 209, accumulation, topsoil, 1750+.

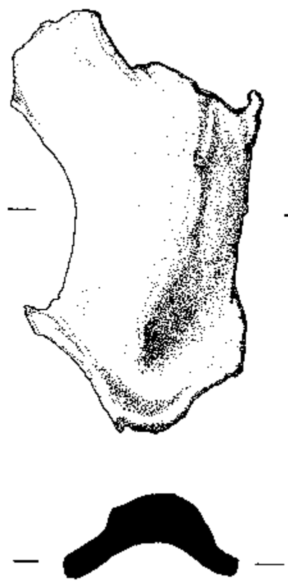
2.235 Binding
A strip of metal folded in half around a circular object. Two nail holes on one side, one visible on the other. Corroded.
Copper alloy. Width 23.1mm, length 94.0mm.
SF 10083, K 4432, robber-trench for north wall of the ‘Small Basilica’, 1750+.



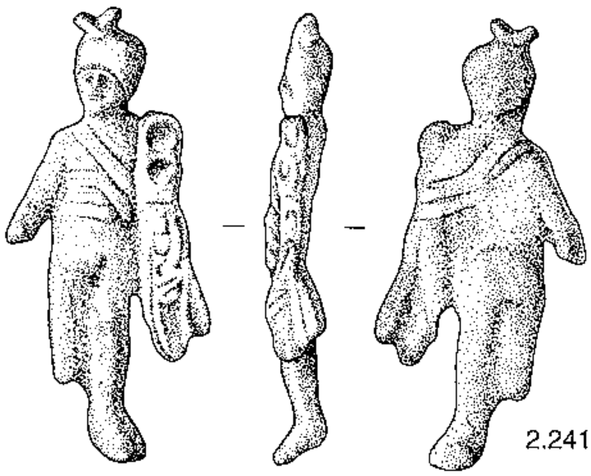
2.238



2.239



2.440



2.241

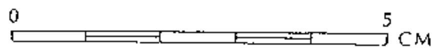


Fig 2.24 Miscellaneous

2.236 Binding?
Fragment of plate folded over with one nail or rivet hole. No doubt intended for recycling as scrap.
Copper alloy. Length 41.6mm.
SF 6339, C 130, secondary cobbled layer on roadway, 300–450.

2.237 Binding for a rectangular wooden object
Iron. Length 33mm.
SF 8094, F 3224, levelling dump beneath the brick floor of the Large Basilica, 450–600.

MISCELLANEOUS (Fig 2.24)

2.238 Lead weight
A small rectangular block, pierced by a small suspension hole.
Lead. Length 40mm, width 13.0mm, thickness 6.0mm.
SF 1204, B, u/s.

2.239 Miniature axe
Triangular section with a splayed blade, its vertical end pierced by a hole for suspension or for a shaft. Not a usual Roman form, possibly medieval. Perhaps a votive object or amulet.
Lead. Length 21.9mm.
SF 6450, C 4007, topsoil, 1750+.

2.240 Statue fragment
A small section with curving relief decoration representing the folds of cloth, perhaps a toga.
Copper alloy. Length 55mm.
SF 14713, P 5051, destruction material from the late Roman city used as make-up in the construction of the early Byzantine tower, *c* 450.

2.241 Statuette of Mercury
The right forearm which would have held a purse and the right leg from below the knee are missing.

The statuette belongs to Georgiev's type 3B (Mercury with caduceus and purse with the chlamys covering both shoulders). To date, eleven figurines of this type have been found in Bulgaria and all come from the region around Nicopolis in the north Bulgarian plain. The young god is standing with his weight supported by his right leg. The left leg is slightly in front of the right, the foot is twisted to the side and the heel is raised. The shoulders, the left part of the torso and the left arm are covered by the cloak, the end of which drapes behind the arm. The right arm is extended. The left arm hangs straight beside the body and the caduceus is grasped in the left hand, its upper end resting on the shoulder. The figure is shown at ease, the body curved towards the right and the face turned in the same direction. The head is crudely formed; the locks over the forehead are represented by incised lines and none are defined on the crown and back of the head. The eyes and mouth are indicated only by small cuts, the nose is too short, the chin, neck and calf of the surviving leg are too massive. The winged petasos is roughly modelled. The details of the caduceaus and folds of the cloak are sketched by lines and not carefully defined. The standard of craftsmanship is accordingly not high and is matched by the other examples of this type and, in particular, is similar to products of a workshop which existed to the east of Nicopolis, in the vicinity of Popovo. (P. Georgiev).
Copper alloy. Height 60mm, width 24mm, thickness 8mm.
SF 4057, D 424, destruction deposit within the post-medieval building, 1750+.

FINDS OF UNCERTAIN FUNCTION (Fig 2.25 and 2.26)

2.242 Washer?
A flat, circular object with a central hole and a groove cut across one side of the object, as if intended to hold a cord.
Lead. Diameter 26.1mm, diameter of the central hole 10.7mm.
SF 12354, M 4951, pit-fill, 250–350.

2.243 Mount
A flat, circular plate with line decoration (?) running towards the outer rim, which is serrated, like a cogwheel.
Copper alloy. Thickness only 1.0mm, diameter 11.0mm.
SF 12098, M 4845, rubbish dump deposit, 250–350.

2.244 Hooked terminal
A looped hook made from wire of circular section but with a short flattened end.
Copper alloy. Height 23.1mm.
SF 5018, A 2017, make-up on the berm of the Roman defences, *c* 450.

2.245 Hook attachment
A hook attached to the top of a curved fragment of plate. Possibly from a vessel, perhaps an escutcheon.
Copper alloy. Length 54.0mm.
SF 12452. M 5518, room 3 primary collapse/demolition of mudbrick walls of the Roman house, *c* 250.

2.246 Decorative appliqué
Fragment of metal with repousé decoration.
Copper alloy. Length 72mm.
SF 6433, C 4006, topsoil, 1750+

2.247 Decorative appliqué
A tapering body, surmounted by two round projections and a lunate top, pierced by a single small hole. Its flat back indicates it is not a terminal but an appliqué although the absence of a second hole at the opposing end suggests it was

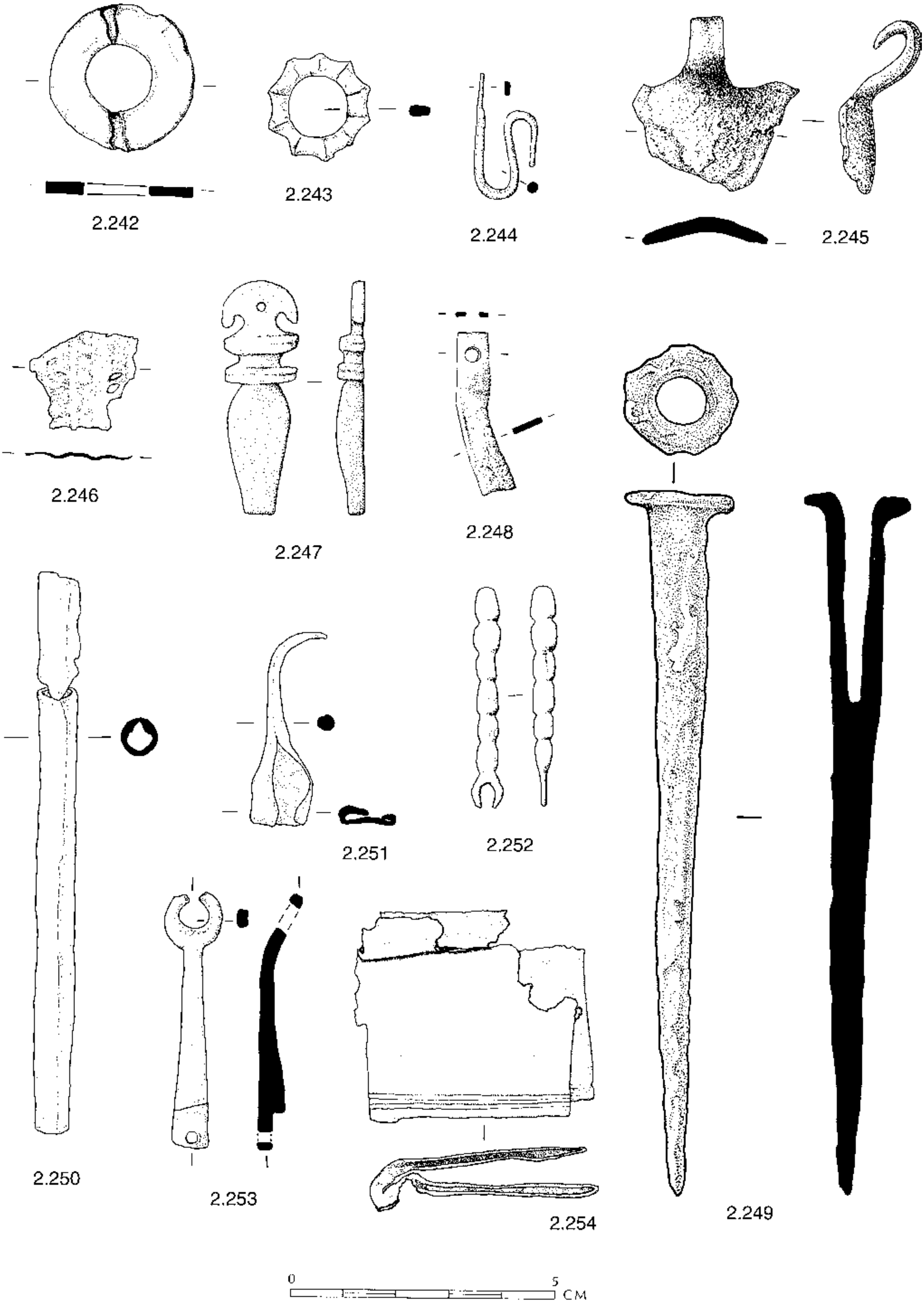


Fig 2.25 Finds of Uncertain Function

not for attachment to a leather strap. Even so, it is similar in shape and perhaps in function, to similar finds from Roman forts on the upper Rhine, interpreted as decorative belt attachments; Oldenstein 1976, 201 nos. 873–8, Taf. 67. Possibly it was applied to furniture: the hole is too small for a rivet but could have retained a small pin for attachment to wood, conceivably used as decoration for a box.

Copper alloy. Length 42.7mm.

SF 5274, A, u/s.

2.248 Strip of metal with rivet hole at one end

Broken at the opposing end to the rivet hole.

Copper alloy. Length 30mm.

SF 3241, E 1088, primary fill of drain beneath the early Byzantine gate, 450–600.

2.249 Tapering, hollow instrument

This tapering iron object has a curious form and its purpose remains uncertain. It is not the mouthpiece of a musical instrument: the lower part of the 'spike' is not hollow. The body is covered in copper alloy and has traces of white metal, suggesting a decorative function but its wide top is roughly made and irregular but is not, apparently, damaged.

Iron and copper alloy. Length 129.9mm, diameter of the top 20.7mm, internal diameter of the hole at the top 8.0mm.

SF 6007, C 88, occupation level outside post-medieval building, 1750+.

2.250 Metal tube

It has an irregular surface and is not decorative, as would suit a cosmetic instrument holder. Two fragments, the smaller broken at its end away from the larger section.

Copper alloy. Length 103.0mm, diameter 7.5mm.

SF 2511, B 265, fill of pit containing domestic waste, 100–130.

2.251 Hooked instrument

This delicate object has a socketed end (now squashed flat) which suggests it had been mounted on a thin shaft, presumably of wood.

Copper alloy. Length 35.8mm.

SF 14141, P 5018, make-up dump from the

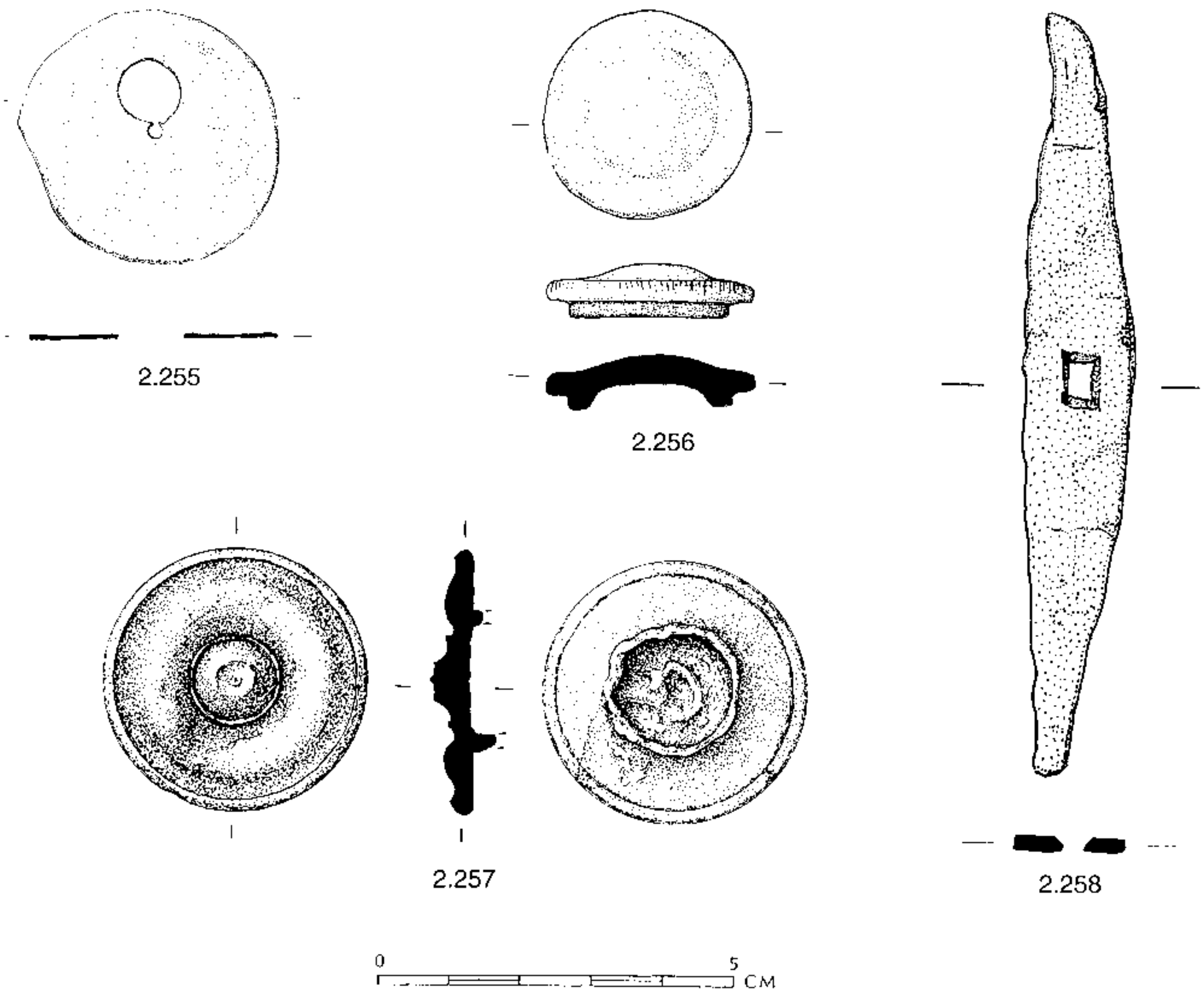


Fig 2.26 Finds of Uncertain Function

interior of the tower, taken from the destruction level within the Roman city, *c* 450.

2.252 Jangle?
Beaded decoration along the shaft with an undamaged open claw for attachment. It resembles similar finds interpreted as jangles, albeit themselves part of an object of decorative but indeterminate function; Crummy 1983, no. 4620, fig 202).
Copper alloy. Length 41.2mm.
SF 6454, C 4007, topsoil, immediately overlying cobbled road surface, 1750+.

2.253 Attachment
A strip of metal with a claw hook at one end angled away from the other which increases in thickness before being cut back to form a small 'ledge' pierced by a small hole, just possibly for a very small rivet, in which case the ledge may have held a leather strap. Still, the ledge is too narrow to hold a belt and the hole is more likely to have been for a small metal pin than a rivet. The claw is just slightly damaged on one side.
SF 6388, C 158, cobbled road surface, 300–450.

2.254 Folded rectangular plate
Each 'leaf' of this object is formed from a double thickness of metal. Its outer face is decorated by four engraved lines and both its outer faces are covered with white metal.
Copper alloy and white metal. Length 41.1mm, width 38.2mm.
SF 11026, C 5306, burnt dump, backfilling defensive ditch 3, 250–350.

2.255 Circular plate
A flat disc of metal with a slightly down-turned rim and a small round hole, 8.9mm in diameter, with just one small rivet or nail hole immediately below. The reverse face has a rough surface.
Copper alloy. Diameter 35.7mm.
SF 14327, P 5027, dump of destruction material, 150–250.

2.256 Metal lid?
A circular plate with a domed top and a projecting circular seating below.
Iron. Diameter 57.4mm.
SF 4, A 1, topsoil, 1750+.

2.257 Decorative circular mounting
A fine, lathe-turned circular object with smooth, well moulded surface and raised ridge around the edge. On the reverse, the outer half of the disk is equally smooth and decorated with an engraved circle just within the rim. Clearly this side was also intended to be seen. The centre of the reverse side is rough and a circular, hollow attachment has broken away. Perhaps a mount for the end of a scroll.
Copper alloy. Diameter 37.3mm, diameter of the circular, hollow projection 18.3mm.
SF 12381, M 4976, destruction level within the Roman house, *c* 250.

2.258 Weight?
A plate of metal, tapering towards the ends with a central rectangular hole (3.2 × 6.5mm). Possibly used as a fishing weight.
Lead. Length 107.4mm.
SF 10221, K 4508, floor level within the 'Early Building,' 250–450.

POST-MEDIEVAL FINDS

Only a small proportion of the metalwork of post-medieval date is published in this volume. Those finds which are included here have been selected because they represent types of find common in the region but which have been published as medieval. The following evidence clearly indicates, however, that they belong to the late 18th or 19th centuries. Post-medieval weaponry has not been published before from archaeological contexts and because of its intrinsic interest, as well as its relevance to the later history of Stari Nikiup, it, too, has been included and is to be found in the section on armour and weapons. Post-medieval nails are discussed along with Roman and early Byzantine nails in the following section.

CALKINS (Fig 2.27)

2.259 Calkin
One end broken and central rivet lost.
Iron. Length 90.0mm.
SF 8056, F 5005, u/s.

2.260 Calkin
Central rivet missing.
Iron. Length 66.6mm.
SF 7322, F 3001, topsoil, 1750+

2.261 Calkin
All rivets in position.
Iron. Length 95.0mm.
SF 7314, F 3045, fill of robber-trench, 1750+.

2.262 Calkin
Half preserved.
Iron. Length 90.0mm.
SF 14093, P 5005, fill of robber-trench, 1750+.

2.263 Calkin
Half preserved.
Iron. Length 87.0mm.
SF 3, A 1, topsoil, 1750+.

2.264 Calkin
Half preserved.
Iron. Length 82.0mm.
SF 29, C 12, topsoil, 1750+.

2.265 Calkin
Half preserved.
Iron. Length 88.0mm.
SF 1104, C 24, robber spoil, 1750+.

2.266 Calkin
Half preserved.
Iron. Length 71.5mm.
SF 2054, B 201, topsoil, 1750+.

2.267 Calkin
Half preserved.
Iron. Length 72.1mm.
SF 6438, C 4006, topsoil, 1750+.

2.268 Calkin
Half preserved.
Iron. Length 87.7mm.
SF 6459, C 4007, topsoil, 1750+.

2.269 Calkin
Half preserved.
Iron. Length 77.5mm.
SF 7056, F 3001, topsoil, 1750+.

This class of object is easily identifiable as metal reinforcements for leather boots or shoes. Typically, as with the examples illustrated, they comprise a horse-shoe shaped piece of metal, slightly concave in cross-section, with tapering ends. Invariably, holes through the bottom centre and tops of the ends were punched to retain iron rivets to fix them to the leather sole. Without exception, all finds came from post-medieval contexts. At Tsaravets, amongst calkins of different form, there are examples identical to those published here; *Tsarevgrad Turnov* vol. 2, type 1, 303–4, fig 113. Since there is no evidence for medieval occupation at Nicopolis,

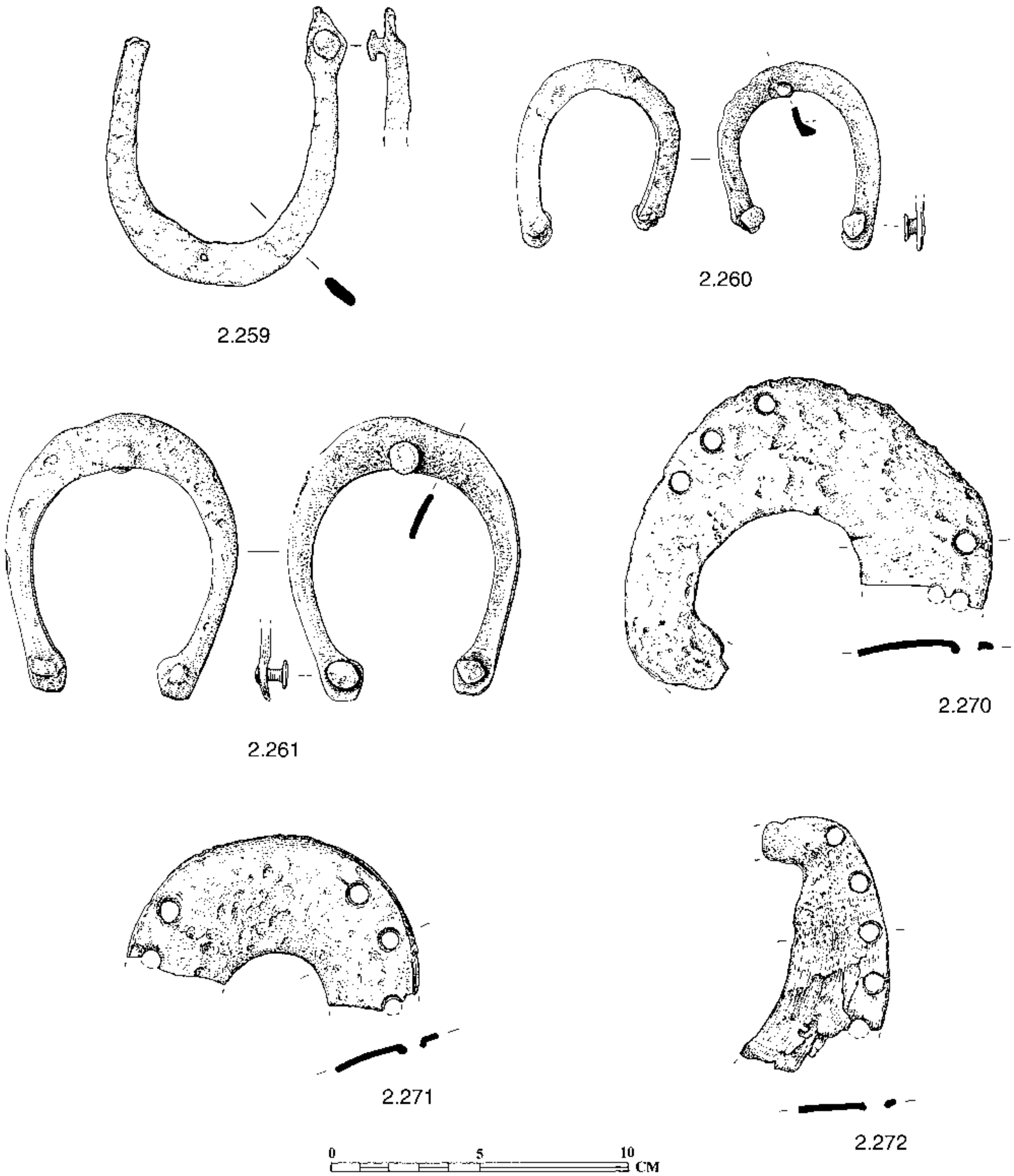


Fig 2.27 Calkins and Horse-shoes

it is now certain that this type of calkin belongs to the post-medieval period.

HORSE-SHOES (Fig 2.27)

2.270 Horse-shoe
Remarkably irregular spacing of the nail holes. Half preserved.
Iron. Diameter 124mm.
SF 1110, C 24, topsoil, 1750+.

2.271 Horse-shoe
Half preserved.
Iron. Diameter 97.1mm.
SF 77, C 55, pit-fill, 1750+.

2.272 Horse-shoe
Fragment with closely spaced nail holes.
Iron. Length 82.0mm.
SF 1013, B 203, ditch fill, 1750+.

2.273 Horse-shoe
Fragment.
Iron. Length 50mm.
SF 1001, A 1, topsoil, 1750+.

2.274 Horse-shoe
Fragment.
Iron. Length 77.5mm.
SF 1032, D 402, destruction level, 1750 +.

2.275 Horse-shoe
Fragment.
Iron. Length 61.0mm.
SF 1060, D 401, topsoil, 1750+.

2.276 Horse-shoe
Fragment.
Iron. Length 81.5mm.
SF 2579, B, u/s.

2.277 Horse-shoe
Fragment.
Iron. Length 79.4mm.
SF 10032, K 4402, demolition debris, 1750+.

2.278 Horse-shoe
Fragment.
Iron. Length 78.0mm.
SF 10064, K 4433, pit-fill, 1750+.

2.279 Horse-shoe
Fragment.
Iron. Length 57.0mm.
SF 12202, M 4885, destruction debris, 1750+.

All of these horse-shoes are roughly cut from iron plates. They vary from a rough 'horse-shoe' shape (2.270) to almost circular (2.271). Punched holes for nails are irregularly positioned around the edge, often in groups (2.270 and 2.271), sometimes closely spaced (2.272). Possibly, they were also used by oxen (Manning pers com). Although crudely made, shoes of this type were still in use after the First World War; similar examples appear in a military manual for cavalry, issued in the 1920's, and owned by a villager from Nikiup. Similar examples were found at Tsaravets and are published as dating to the 12th–14th century; *Tsarevgrad Turnov* vol. 2, 311–312 and fig 122. Given that there is no evidence that Nicopolis was occupied in the medieval period and because all of the finds come from post-medieval contexts, it seems clear that this particular type of shoe dates to the 18th to early 20th century.

NAILS (Fig 2.28)

A total of 683 nails were identified of which 170 (25 %) were undamaged. Many more small iron fragments were no doubt also parts of nails but were too poorly preserved for positive identification. In all, 55 nails could not be assigned with certainty to any of the 12 types and none merited description as a separate form. The following measurements were taken; maximum diameter of head, thickness of the shank 1.5cm below the head, and length. Even though the state of preservation of the conserved nails was unusually good when compared to the kind of finds commonly recovered from west European sites, corrosion, fragmentation (and zealous conservation) inevitably mean that measurements can only be taken as an approximate guide to form and size.

The nail typology includes both iron and copper-alloy finds although the latter may have had a decorative rather than a purely functional application. Where appropriate, reference is made to the nail typology established by W.H. Manning; Manning 1985, 134–7. Measurements for each type are taken only from complete examples.

Here, the drawing numbers of those illustrated (Fig 2.28) are noted at the beginning and on the same line as the type number. Following the description, the small-find numbers for the illustrated finds are listed in the same sequence so each find drawn can be linked with its small-find number.

N / 1, **iron, 2.280–2.286**

The shaft is square or rectangular in section, tapering towards the point and with a slightly domed, irregular head, round or rectangular in shape. This is equivalent to Manning 1B. No larger nails, in excess of 300mm in length (Manning type 1A), were found.
SF 12222, 14359, 11119, 3043, 4384, 8344, 10153.

There were 384 nails identified as belonging to this type, of which 95 were complete. Of these, the average length was 78.3mm, the smallest 26.2mm, and the longest 144mm. The majority were between 65 and 80mm in length but there appears to have been no other 'standard' size within this group. Thickness of the stem varied between 8.0 and 12.4mm, the average being 7.3mm. The diameter of the head, as would be expected, varies still more, from 13.0 to 40.9mm (average 22.4mm).

A total of 40 came from contexts that could not be confidently dated. Of the remaining 344, 2 = 100–130, 6 = 130–175, 16 = 175–250, 44 = 250–300, 122= 300–450, 54 = 450–600, 101 = 1750+. Variations in the numbers of nails from the

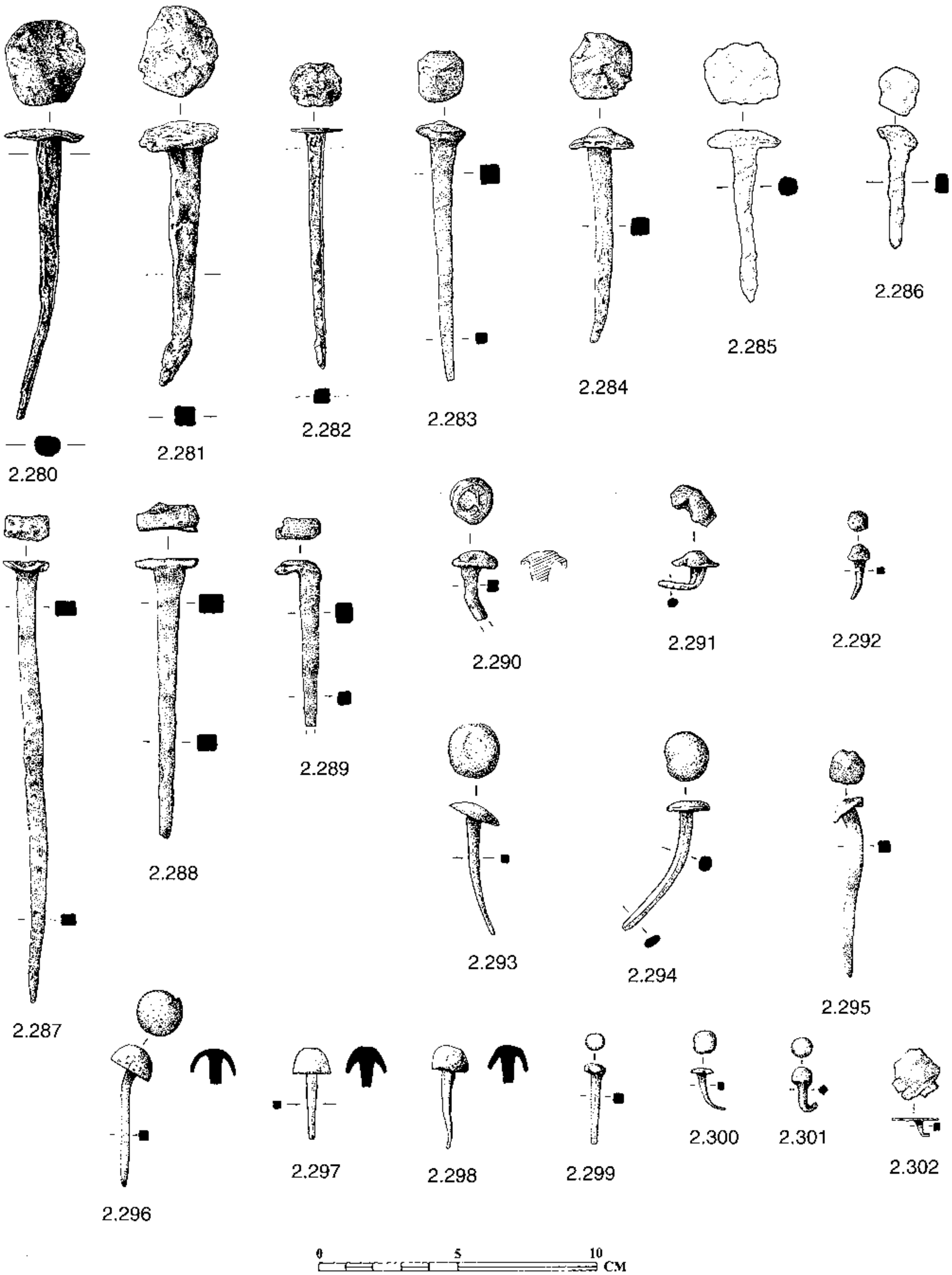


Fig 2.28 Nails

different periods (Roman, late Roman and early Byzantine) are of no historical significance; the totals correspond closely to the quantities of deposits excavated for each period of occupation (see introduction, pp. 4–5). However, notable are the 29 which came from the 3rd century destruction spread in area M where they were found amongst the *in situ* collapse of tiles and burnt timbers from the roof of the building destroyed *c* 250: presumably they were used either to join the roof timbers or to hold the Laconian roof-tiles in position. The comparatively large number of nails from post-medieval deposits reflects the proximity of the final early Byzantine destruction levels to the surface where they were frequently contaminated by post-medieval occupation and robbing. Even so, in areas F and K, the majority of nails did come from the destruction deposit overlying the brick floors of the two churches and must consequently be of 6th century date.

Clearly, the standard N1 nail was in use at Nicopolis from the early 2nd century, throughout the late Roman period and down to the end of the 6th century.

N / 2, **iron**, **2.287–288**

This nail has a distinctive square or rectangular, thin, tapering stem with a rectangular, flat, narrow head, often waisted in the middle above the shaft.

SF 12024, 6019.

Only 19 examples have been found, of which 15 are complete. They range from 27.3 to 160mm, averaging 90mm in length. The thickness of the stem varies from 5.0 to 6.5mm, the maximum diameter of the head from 13.0 to 16.7mm.

The condition of most examples is unusually good which suggests that they are of recent origin: a dating supported by the contexts from which they came. Although 3 cannot be dated, the remaining 16 were all found in post-medieval levels. Consequently, the type can be confidently assigned to the 18th or early 19th centuries and must have been in use in the post-medieval settlement.

N / 3, **iron**, **2.289**

An ‘L-shaped’ head, no wider than the stem which is square rather than rectangular in section SF 7449.

A modest number, 13 examples, were found, of which 8 are complete.

Equivalent to Manning type 4. This type appears in different sizes, including small examples (33.6mm long) and medium-sized specimens (121.0mm in length). Similarly, the thickness varies from as little as 3.0mm up to 7.5mm for the longer specimens.

Of the 11 dated examples, although 8 (residual) finds come from post-medieval contexts, 3 were well stratified: one dated 300–450, another 400–450, the third 450–600.

N / 4, **iron, 2.290–291**

This has a small, round-sectioned stem with domed, hollow head

SF 4184, 5113.

Equivalent to Manning type 8. Only 7 examples were found, of which 3 were complete.

The stem is thin (average 3.2mm), the length ranging from 26.0 to 34.6mm, the diameter of the head varying slightly from 14.2 to 19.6mm.

Certainly a Roman type and probably still in use in the early Byzantine period; 1 =150/250, 1 = 175–250, 2 = *c* 450, 2 = 450–600, one (residual) = 1750+.

N / 5, **Iron, 2.292**

A small nail or tack with rectangular, flat or globular head.

SF 4489.

The majority were certainly used as hobnails (Manning, type 10). Identified were 172 of which only 5 were judged complete. The stem is short, from 9.1 to 20.0mm in length and *c* 3.0mm thick with heads varying slightly from 7.5 to 12.0mm in diameter.

This type is a common find from the 2nd century and continues through the late Roman and into the early Byzantine periods. Only 6 came from undated contexts. The cobbled road surface, leading to the gate of the city (areas B and C), produced 53 examples which is not surprising since it was the only access into the city from the south. However, finds were not evenly spread through the cobbled surfaces; many occurred in clusters: 27 from context 130, 4 from context 247, 9 from 4095. (Note, successive localized and thin spreads of cobbles were assigned different context numbers so each of these represents only a few square metres of material, *c* 50mm deep). The likely explanation is that, apart from metalwork and bone waste, this surface contained household rubbish, which included discarded leather footwear. Somewhat curiously, the collapsed roof-tile and burnt roof beams left *in situ* on the floor of room 3 in the Roman house (area M) after it had burnt down *c* 250 produced 44 specimens. Perhaps footwear was amongst items left in the house at the time of its destruction (Poulter 1995, 198). Of singular interest are the concentrations from the dumps of soil within tower 1 (area P) which has been interpreted as representing successive barrow loads of destruction material brought in from the ruins of the Roman city, destroyed *c* 450 (Poulter 1995, 214– 5). These concentrations also no doubt came from boots or sandals transported with the rest of the destruction debris and dumped as make-up during the construction of the early Byzantine fortifications.

N / 6, **copper alloy 2.293–294**

This form has a rectangular or round, tapering

stem but with a distinctive, wide, saucer-shaped, convex head.
SF 8231, 14204.
Only two examples have been found. The length of the stem is 45/55mm and is 4.2/3.5mm thick. The head is 20.0/17.2mm in diameter.
One is undated (SF 8231) but the other came from the mid 5th century destruction deposit (SF 14204) *c* 450.

N /7, **copper alloy, 2.295**
A small, flat-headed nail with a square, tapering shaft.
SF 2285.
Length 65.0mm, 4.7mm thick, diameter 13.0mm.
Only one example was found, dated 300–450.

N 8, **copper alloy, 2.296–298**
A dome-headed nail with a short, square-sectioned, tapering stem.
SF 7, 12097, 12280.
Only 10 were found. In the 7 complete examples, the length varies between 26.9 and 55.0mm, the thickness between 2.8 and 3.0mm, in diameter from 14.4 to 17.5mm.
Three came from post-medieval contexts and are certainly residual. Of the rest, 5 came from late Roman contexts (300–450) and two, possibly also residual, from early Byzantine deposits (450–600). Clearly decorative in function.

N / 9, **copper alloy, 2.299**
A short spike or tack with small, round head.
SF 6351.
Two examples were found. Length 26.8/27.7mm, thickness 3.0/2.7mm, diameter 5.1/6.6mm.
Both date 300–450. Probably used for upholstery.

N / 10, **copper alloy, 2.300**
A flat-headed tack with a square head and a short, tapering, square or round-sectioned stem.
SF 4118.
Of 5 examples, 3 were complete. Length varies slightly between 15.0 and 20.8mm. They were all *c* 3.0mm in thickness and the heads ranged from 7.9 to 13.3mm in diameter.
Apart from one undated and another residual find from a post-medieval context, the others are Roman (one example, 150/250) and late Roman (2 examples, 250/350). Like N/9, probably for upholstery.

N / 11, **copper alloy, 2.301**
A short nail or tack with square shaft and globular head.
SF 12018.
Length 19mm, diameter 7.4mm.
One example only and from a post-medieval context.

N / 12, **copper alloy, 2.302**
This has a comparatively large, splayed head with short thin stem.
SF 5137.
Only two examples found. The complete example is illustrated. Length 10.0/8.0mm, diameter 17.2/13.4mm.
The stem is so thin and short that this type could only have had a decorative function, perhaps applied to a box or furniture.
One is unstratified, the other dates 150–250.

SCRAP FROM NICOPOLIS

During the course of the excavations, it became increasingly apparent that lead and copper-alloy objects were not randomly distributed but concentrated in certain parts of the site. Although many of the finds were fragmentary, both metals were of intrinsic value. Pliny observed that lead and bronze objects, which were no longer considered useful, were bought up because the used metals were prized, especially for mixing with copper ore when casting statues and bronze tablets (*Nat. Hist.* XXXIV. 20, 97). The recasting of copper-alloy objects must have been regularly carried out, especially in urban centres where a ready source of scrap metal was available. It would have been cheaper to recycle than importing ingots or processing ore. The most significant find from the region has been the discovery of substantial quantities of metal fragments, including parts of statues, in the *principia* of the legionary fortress at Novae; they had been cut up and were clearly intended for recasting (*Novensia* V, 18–22). Lead, as well as being a required additive in casting bronze, could be easily reused. Substantial quantities were needed at Nicopolis in the Roman period where it was used, for example, in securing iron clamps joining stone blocks in the construction of public buildings and the Roman fortifications (Poulter 1995, 85).

Even so, proving that concentrations of lead and copper-alloy objects represent scrap collected for recycling is not so easy, even though the practice of reprocessing metal objects must have been common practice. In most cases, where finds are broken or distorted, damage could have occurred after primary deposition. It could equally be true that broken objects may have been discarded as rubbish and never collected for recycling. However, one discrete group of finds from Nicopolis can be

confidently identified as scrap: where the finds took the form of droplets, lost during the manufacturing process, or, more commonly, where they have been cut, bent, or rolled up with the clear intention of reprocessing the metal. Finds which, on these grounds, could be confidently described as scrap were weighed and given the type code S(crap) in the small-find records. After the final dating for contexts had been applied to the small-find database, it was possible to list all scrap finds by area, number of finds, weight and context and then to allocate them to one of the five main periods of occupation; 100–300 (Roman), 300–450 (late Roman), 450–600 (early Byzantine), 800–1000 (Slav) and 1750 – *c* 1850 (post-medieval). In total, 167 scrap finds were identified; 101 copper-alloy objects with a total weight of 229.35g and 66 lead finds, weighing 1,026.43g. Only 7 objects were unstratified; 3 lead finds from area B (total weight 29g), 3 lead finds from area K (total weight 38g) and 1 copper-alloy object from area C (3.55gm). Consequently, these are omitted from the discussion of distribution by period but are included in the following calculations by number of finds and weight for each area.

As would be expected for such a heavy metal, there is a wide variation in the weight of lead objects, ranging from 2.25g to 120.6g, an average of 18.66g per object. In the case of copper-alloy scrap, the range was from 0.24g to 27.94g, with an average of 3.82g per find. Particularly in the case of lead, this difference in the weight of finds could affect, and might significantly undermine, any argument for the distribution of scrap using only weight as the determining factor.

The distribution of all scrap by weight

Table 2.1 The total weight of scrap by period

Copper-alloy finds

Period	Total Weight/g	Number of Finds
100–300	19.91	19
300–450	188.08	75
450–600	2.98	2
800–1000	-	-
1750+	14.83	4

Lead finds

Period	Total Weight/g	Number of Finds
100–300	12.62	2
300–450	489.26	38
450–600	155.37	7
800–1000	3.60	1
1750+	298.55	12

What is immediately clear is that the distribution by period, calculated both by weight and by number of finds, indicates that the majority of lead and copper-alloy scrap came from deposits dated to the late Roman period (Table 2.1). When the quantities of both kinds of scrap from each of the 11 excavation areas are compared, it is evident that there were notable concentrations in areas B, C, K and P (Fig 2.29 A). Note that the cuttings L, N and H produced no scrap finds. However, given the restricted extent of excavation, it is not possible to determine whether these parts of the site would have produced significant quantities of scrap if area excavation had been carried out. The relative quantity of finds (calculated by weight) for all scrap shows that area C produced most (23.4 %), then area K (16.5 %), in turn closely followed by area P (16.1 %) then B (11.7 %). Area D (9.2%), considering that it was one of the largest areas in terms of the quantity of deposits excavated (and included deep deposits of the late Roman period) produced comparatively little material. Other areas (A, E, F, M, R, S) produced only minimal amounts. Even so, this general breakdown by area of all scrap material must be treated with caution. In particular, given that lead finds were regularly heavier than copper-alloy, the general distribution is skewed in favour of the former. Moreover, area K produced one exceptional heavy find weighing 120.60g and another well above the norm (45.95g). When the distribution of lead is calculated by the number of finds, area K is of much less importance, leaving only three notable peaks for areas B, C and P (Fig 2.29 C). Clearly, it is best to treat the distribution of lead and copper-alloy finds separately and to compare the relative distribution by weight against the actual number of finds to identify anomalous variations in the overall pattern.

The spatial distribution of lead scrap

Comparing the distribution of scrap by weight and by number of finds is instructive (Figs 2.29 B and C). There is a tolerably close correlation between both methods of calculating scrap for those areas where quantities were relatively insignificant (areas A, E, F, M, R, S): differences between totals by

weight and by number of finds varied by no more than 6 per cent. As noted above, the discovery of two unusually heavy finds in area K produces an apparently significant total of 19.9 % by weight, but this figure is reduced to 7.6 % when distribution is calculated by the number of finds. The lead scrap from area D which, by weight, represents 10.9 % of the total is reduced to only 4.5 % when measured by the number of finds and for the same reason; the three finds of lead scrap from this area (34.0, 35.0 and 43.0g) are notably heavier than the norm. However, in the case of areas B and C, which produced relatively large amounts of scrap by weight, their dominance was still more evident in the number of finds: B increases from 11.0 to 16.7% and C from 19.4 % to 28.8 %. Area P, though its importance by number of finds declines slightly (from 13.7 % by weight to 10.6% by number of finds) remains, along with areas B and C, the only area to produce more than 10 % of the total assemblage.

The spatial distribution of copper-alloy scrap

In the case of copper alloy, where the weight of individual finds showed less variation, distribution by weight is more closely matched by distribution calculated by number of finds (Fig 2.29 D and E). In the case of those areas (A, D, E, F, K, R) producing small quantities (less than 6% of the total by weight), the difference between calculations by weight and number of finds is less the 4%. In these areas, the relative importance of scrap is reduced still further when the number of finds is applied – with the exception of area R – although here the actual quantity of scrap is so small that the marginal difference (1.00 % by number of finds as compared to 0.9 % by weight) is of no significance. The

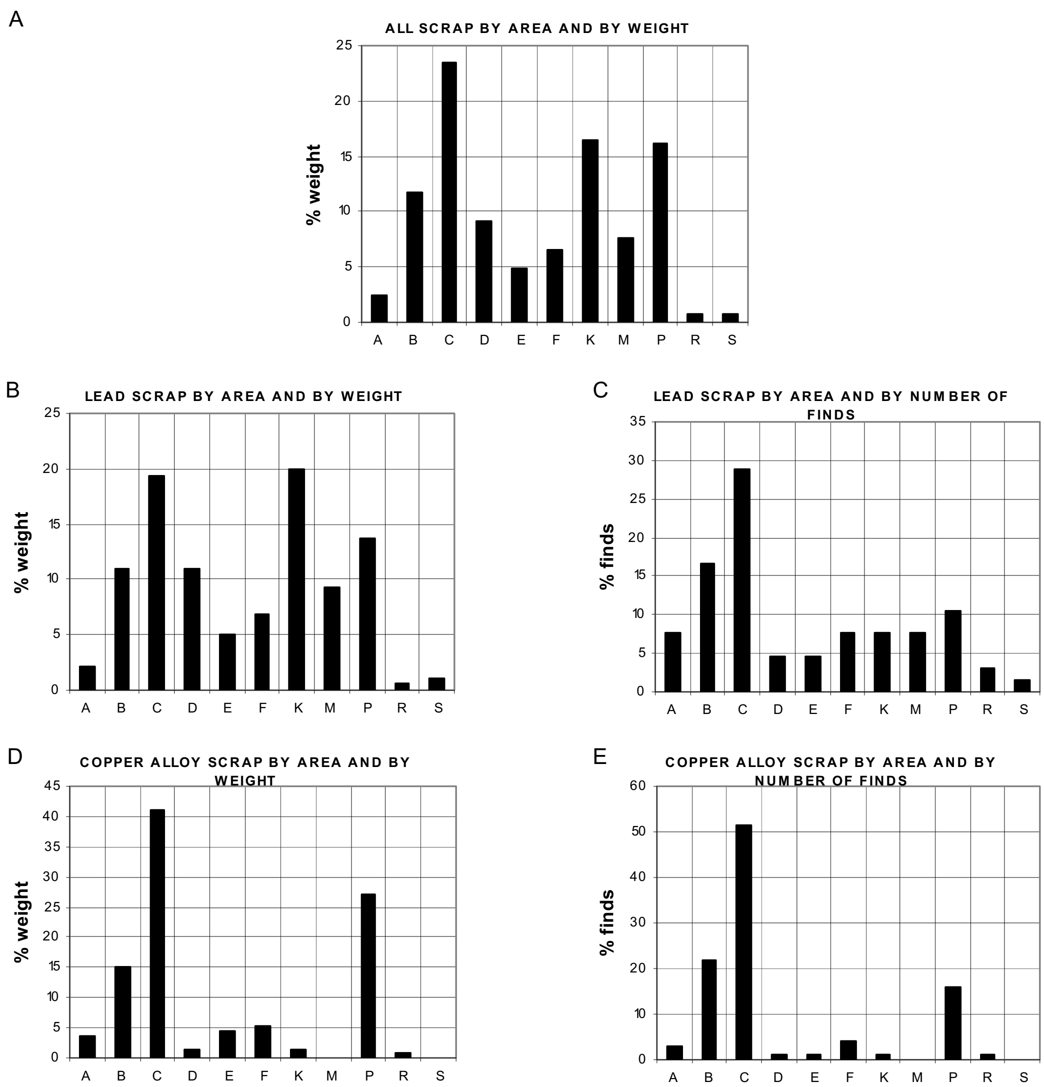


Fig 2.29 Distribution of lead and copper alloy scrap by area, weight and number of finds

results essentially mirror those established for the distribution of lead scrap, not only demonstrating the dominant position of areas B, C and P but also the exceptional quantity coming from area C which contained 41.0% by weight and 51.5 % by number of finds. Area B has 15.0 % by weight and 21.8% by number of finds. Area P produced 27.2% of the total by weight and 15.8% by number of finds. In each of these cases, the dominance by number of finds was slightly greater than by weight although the variation in all instances was less than 12 per cent.

Conclusion

Considering both lead and copper-alloy finds, the spatial distribution of scrap shows a marked peak for area C, followed by lesser peaks for areas B and P. Elsewhere, scrap finds were comparatively few. It has already been noted above that there is also a marked concentration of scrap in period 2 (300–450). This further bias in the archaeological record will be discussed first before considering possible explanations.

The distribution of scrap finds by area and by date

The concentration of both lead and copper-alloy scrap in areas B, C and P is clear in both calculations of weight and number of finds. In assessing the chronological distribution of scrap, weight has here been used in the graphs (Fig 2.30 A and B). It will be apparent from the preliminary discussion above that the results by weight would not be markedly at variance with the totals by number of finds, except that, using the number of finds, the concentration in the three dominant areas is still more pronounced.

The distribution of lead finds

The general picture appears, at first glance, to be somewhat mixed (Fig 2.30 A). Very little scrap can be dated to the Roman period (100–300). More scrap dates to the late Roman period, with a strong bias towards areas C, B and P. Exceptionally, areas D and F produced lesser amounts in contexts dated to the late Roman than the early Byzantine period. But in both areas, residuality in pottery from these later contexts was notably high and it is not unlikely that most, if not all, of the scrap was also residual. For the Slav period (800–100) only one find came from the grubenhaus (area F) and must be considered residual. Probably the same applies to the post-medieval finds. As already observed the apparent importance of area K is exagerated because post-medieval contexts produced two particularly heavy and probably residual finds.

The distribution of copper-alloy finds

The general picture for this category of scrap is as notable for its concentration by period as it is for its concentration in relatively few locations (Fig 2.30 B). Areas B and E produced small quantities of copper-alloy scrap datable to the Roman period and a minimal amount came from area M. Dominant, however, is the quantity of scrap recovered from late Roman deposits, from area C, from area P and from area B. Notable is the absence of scrap in early Byzantine occupation levels. No finds can be dated to the Slav period and the small quantities from post-medieval contexts in areas F and K are probably residual.

Conclusion

Most of all lead and copper-alloy scrap came from three areas; B, C and P. It is also notable that a significantly high proportion in each case can be dated to the late Roman period (300–450).

Factors which could affect the spacial and chronological distribution

There is inevitably a bias in the archaeological record which could affect the distribution of finds. There were differences between areas; not only were some smaller than others but also the nature of

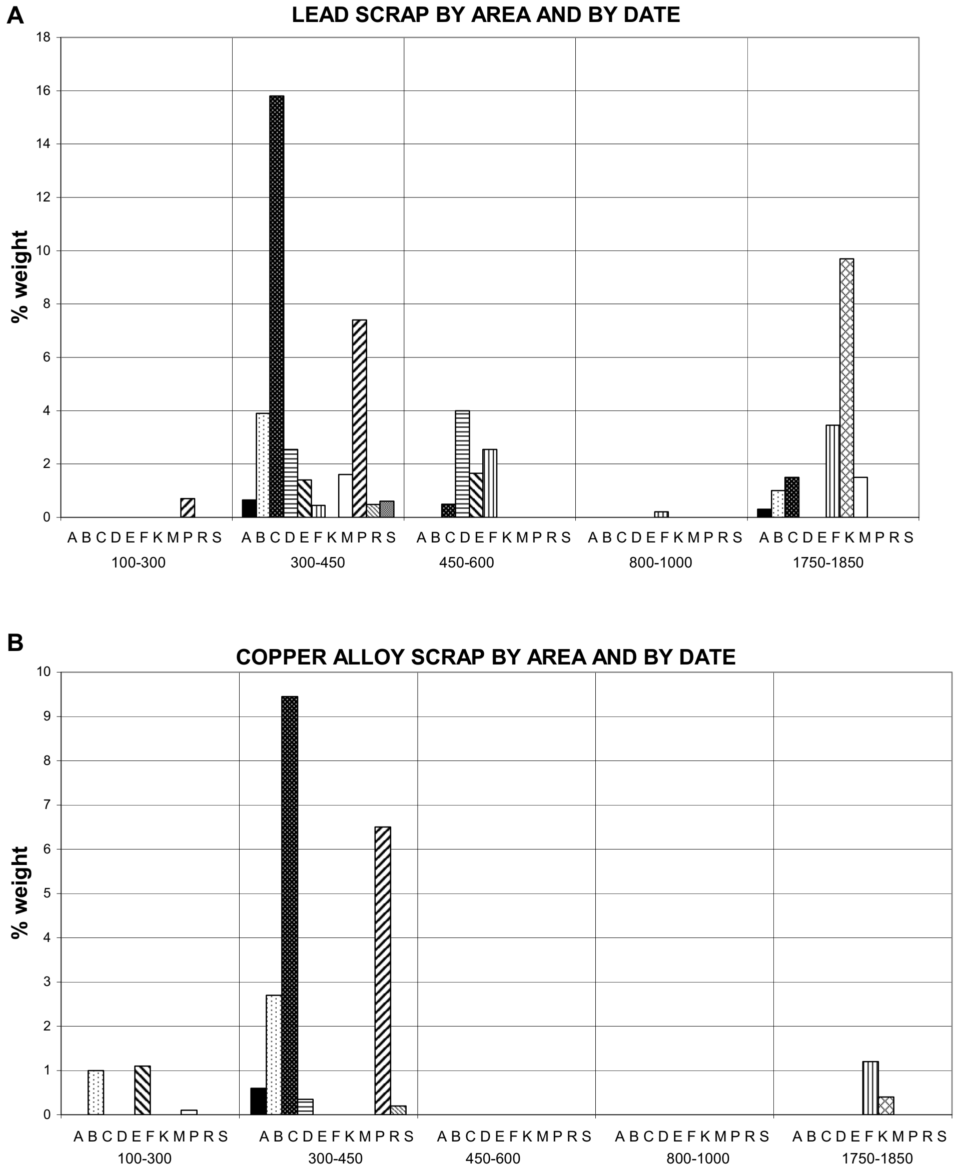


Fig 2.30 Distribution of lead and copper alloy scrap by area and date

deposits varied, as well as the quantity of deposits dating to particular periods (see above, pp. 4–5). The quantity of deposits dating to the Roman and Slav periods was limited in comparison with those belonging to the late Roman, early Byzantine and post-medieval periods. Even so, it is unlikely that the apparent importance of areas P, B and C were affected by these considerations. Here, stratified deposits were always sieved but that was true of all areas and there is no obvious reason why scrap, if it existed in quantity elsewhere, would have escaped detection. Areas where extensive excavation of occupation deposits was carried out include areas A, D, F and M and these are much less well-represented in finds. What is more, each of these areas was rich in deposits of the late Roman period – to which most of the scrap belongs. Area B was the smallest area excavation on the site but still produced a large quantity of both lead and copper-alloy scrap.

It seems that the concentration of scrap in these three areas and in the late Roman period can not be explained by any obvious difference in the quantity of deposits excavated, nor by any difference in the method of excavation. It might seem that the concentration of scrap denotes places where metal-working and, in particular, the recycling of waste products took place although, as discussed below, the nature of deposition which created these scrap rich deposits needs to be considered since it would be unwise simply to conclude that the work had been carried out in those areas.

An explanation for the concentration of scrap finds in area C, B and P dated to the late Roman period

The deposits from which the scrap finds of late Roman date came in both areas B and C were the same: the successive cobbled road surfaces which extended beyond the south gate of the city. It is also relevant to note that, in addition to the scrap, this surface also produced an unusually large number of copper-alloy finds and also iron objects (Poulter 1995, 75 and 98). Why so many iron objects occurred in these deposits is unclear but, although there is no direct evidence that most of the copper-alloy objects were intended as scrap, this would seem quite the most likely reason why they occurred in such quantity and in the same contexts as finds which can be identified with certainty as scrap metal. More problematic is the remarkable concentration of base coinage in these same cobbled spreads; all date to the 4th and first half of the 5th century. The cobble spreads in area B produced 91 coins, the cobbled roadway in C 135 coins. It must be considered possible, therefore, that the coins themselves do not represent casual loss but that they, too, may have been intended for recycling. However, none of the coins were clipped or cut so, on balance, it still seems most likely that they represent loss in an area used for commercial transactions (see Butcher in Poulter 1995, 306). Other finds, unconnected with metal-working, indicate that the this extramural surface was used for a variety of other industrial activities, including the slaughter of cattle (see below, p. 157), glass-working (Shepherd in Poulter 1999, 376–8) and the manufacture of bone implements (see below, p. 79). Possibly the scrap was part of rubbish deposits brought out from the city and dumped. However, since the roadway was still in use down to the final destruction of the city *c* 450, it is improbable that, apart from occasional make-up deposits to repair the surface, rubbish would have been scattered over the cobbled roadway during the late Roman period; domestic waste was then regularly buried in pits (Poulter 1995, 121–4, 198–201). Probably the scrap was lost or discarded during metal-working on, or immediately adjacent to, the cobbled surface. The site was available because, after the construction of the defences in the late 2nd century, no building would seem to have been permitted between the Roman city wall and the large extramural settlement, the northern limit of which lay 50 m south of the curtain-wall. This ‘free fire zone’, though primarily intended to guarantee the integrity of the urban defences, was a particularly suitable location for industrial activity; there was no danger of setting light to houses or agricultural buildings which were densely packed across the plateau to the south (Poulter 1995, 28–33).

The finds of scrap in area P came from an altogether different kind of deposit. This comprised an homogeneous dump of *c* 12.25 cubic metres of earth and clay, redeposited within the foundations of the early Byzantine tower and required to level up for the primary floor. The material represented successive tips of soil, full of metal and bone finds, including 44 coins, dating to the 4th and first half of the 5th century. In date, this deposit was more or less contemporary with the other scrap rich deposits from areas B and C. But there was an important difference: this dump also included destruction material: burnt mudbrick wall fragments and burnt tiles. The most likely explanation is that the deposit represents successive barrow loads of soil and debris brought in from the Roman city and that most of it came from the final destruction deposit which covered the site after *c* 450 (Poulter 1995, 214–5). The alternative, that the soil was taken from areas B and C can be safely discounted; the dump from P contained no significant quantities of pebbles (which would be expected if the late Roman roadway was the source) whereas the burnt building debris in the P deposit was not found in B or C. It would seem to follow that, in the latest years of its existence, the recycling of scrap was not confined to the cobbled surface outside the south gate but was also taking place within the city defences.

Conclusion

The evidence would suggest that recycling of scrap was a major activity in the late Roman period and was carried out outside the south gate on, or close to, the cobbled road surface. Probably also, during the years leading up to the city’s destruction, the same industry was also operating within the city walls.

3

WORKED BONE

by

Anthony Roberts

The excavations produced some two hundred finds. These are largely small domestic tools such as pins, needles and combs. Exceptions include an unstratified bow stiffener (3.177). The discovery of unfinished or roughly worked pieces indicates that bone and antler were being worked in or close to the city.

BONE PINS (Figs 3.1 and 3.2)

These comprise the most numerous finds of worked bone. Their function is uncertain. The larger ones may have been used as garment fasteners, whereas the smaller pins were probably hairpins. They can be divided into seven groups, defined by the shape of their heads, decoration or size. The most common are Type 3, pins with spherical or ovoid heads and baluster shafts. They vary in length but the heads are largely uniform. There are a number of decorated pins (type 7) of variable quality. The most elaborate item (3.179), probably a pin-head, is described separately. It appears to represent the goddess Venus. All the pins can be paralleled from many other sites across the Roman Empire. Principal types and well-preserved examples are illustrated.

Type 1. Pins with a plain head

This type has a plain tapering shaft, the thicker end pointed or rounded.

3.1* Point missing.
Length 38.5mm, diameter of head 6.1mm.
SF 3045, E 1018 robber-trench fill, 1750+.

3.2 Point missing.
Length 23.1mm, diameter of head 5.3mm.
SF 7148, F 3011, demolition level, 1750+.

3.3 Head slightly faceted, point missing.
Length 67.8mm, diameter of head 4.8mm.
SF 2664, B 340, pit-fill, 200–300.

3.4 Head rounded point missing.
Length 51.6mm, diameter of head 5.6mm.
SF 5199, A 2157, backfill of ditch, 450–500.

3.5 Head slightly faceted, point missing.
Length 44.6mm, diameter of head 5.1mm.
SF 4599, D 659 destruction deposit within the 'early building', 250–350.

3.6 Head slightly faceted, point missing.
Length 20.3mm, diameter of head 4.6mm.
SF 4628, D 667, dump deposit of industrial waste, 175–250.

3.7 Head slightly faceted, point missing.
Length 31.7mm, diameter of head 5.0mm.
SF 8067, F 3001, topsoil, 1750+.

3.8* Head slightly faceted, shaft rounded triangular, point missing.
Length 46.6mm, width of shaft 5.8mm, thickness of shaft 5.0mm.
SF 14172, P 5018, make-up for the primary floor of the tower, *c* 450.

3.9 Head flat, point missing.
Length 56.7mm, diameter of 5.8mm.
SF 10185, K 4432, fill of robber-trench, 1750+.

3.10 Head rounded, point missing.
Length 68.8mm, diameter of head 5.7mm.
SF 8181, F, u/s.

3.11 Head flat, point missing. A hole at the head is a natural foramen.
Length 44.8mm, diameter of head 5.9mm.
SF 10225, K 4429, robber-trench fill, 1750+.

3.12 Head flat, point missing.
Length 35.7mm, diameter of head 44.0mm.
SF 10248, K 4513, make-up, 250–350.

3.13* Head rounded, point missing.
Length 68.7mm, diameter of head 6.2mm.
SF 8304, F 3214, destruction deposit, 1750+.

3.14 Straight shaft with slightly faceted head.
Length 32.2mm, diameter 4.3mm.
SF 14283, P 5021, dump of destruction debris, 250–300.

Type 2. Pins with transverse grooves beneath a flat head

3.15* Flat headed, tapering pin, with three transverse grooves beneath head.
Length 111.3mm, diameter of head 5.6mm.
SF 4394, D 576, destruction deposit, 375–450.

Type 3. Pins with spherical or ovoid heads

The shafts have a swollen or baluster shape caused by the undercutting of the head. This type is the most common form.

3.16 Head almost pointed, point missing.
Length 59.2mm, diameter of head 4.3mm, max diameter of shaft 4.2mm.
SF 4098, D 434, topsoil, 1750+.

3.17 Point missing.
Length 49.8mm, diameter of head 3.8mm, max diameter of shaft 3.7mm.
SF 4131, D 445, primary collapse over floor in west room of the 'workshops', 450–600.

3.18* Complete, point reworked.
Length 57.0mm, diameter of head 3.9mm, max diameter of shaft 3.9mm.
SF 3030, E 1028. pit-fill, 450–500.

3.19 Head roughly spherical, point missing.
Length 76.7mm, diameter of head 5.4mm, max diameter of shaft 4.2mm.
SF 4504, D 607, lower fill of pit, 400–450.

3.20 Head spherical, point missing.
Length 56.6mm, diameter of head 5.3mm, max diameter of shaft 3.5mm.
SF 4529, D 478, surface, undated.

3.21* Complete, head spherical.
Length 96.1mm, diameter of head 4.9mm, max diameter of shaft 4.2mm.
SF 10077, K 4405, topsoil, 1750+.

3.22 Head octahedral, point missing.
Length 35.4mm, diameter of head 3.2mm, max diameter of shaft 3.2mm.
SF 14048, K 4405, topsoil, 1750+.

3.23 Head spherical, point missing.
Length 52.0mm, diameter of head 4.5mm, max diameter of shaft 4.4mm.
SF 8075, F 3163. robber-trench fill.

3.24 Head spherical, point missing.
Length 56.4mm, diameter of head 4.5mm, max diameter of shaft 3.4mm.
SF 10106, K 4453, make-up for nave floor, 450–600.

3.25* Complete, head ovoid.
Length 101.1mm, diameter of head 4.9mm, max diameter of shaft 4.1mm.
SF 10198, K 4404, u/s.

3.26 Head pointed, point missing.
Length 55.2mm, diameter of head 4.5mm, max diameter of shaft 3.7mm.
SF 10226, K 4479, robbing debris, 1750+.

3.27* Complete, head spherical.
Length 82.1mm, diameter of head 5.5mm, max diameter of shaft 4.0mm.
SF10241, K 4512, make-up deposit, 300–450.

3.28* Almost complete, head spheroid.
Length 101.0mm, diameter of head 4.2mm, max diameter of shaft 3.6mm.
SF 10239, K 4512, make-up deposit, 300–450.

3.29 Head pointed, point missing.
Length 30.3mm, diameter of head 4.5mm, max diameter of shaft 3.7mm.
SF 14305, P 5022, dump of destruction debris, 250–300.

3.30 Almost complete.
Length 79.2mm, diameter of head 4.9mm, max diameter of shaft 3.5mm.
SF 10220, K 4507, surface outside building, 300–450.

3.31 Complete but broken in two.
.Length 84.0mm, diameter of head 3.2mm, max diameter of shaft 3.8mm.
SF 10253, K, u/s.

3.32 Head ovoid, point missing.
Length 35.9mm, diameter of head 4.2mm, max diameter of shaft 4.3mm.
SF 8346, F 3365, cobbled road surface, 375–450.

3.33 Head pointed ovoid, point missing.
Length 46.7mm, diameter of head 4.2mm, max diameter of shaft 3.0mm.
SF 12363, M 4961, pit-fill, 250–300.

3.34 Head ovoid and laminating, point missing.
Length 19.5mm, diameter of head 6.3mm, max diameter of shaft 3.0mm.
SF 13526, S 5288. accumulation, 100–400.

Type 4. Pins with large ovoid heads

Similar to Type 3 but the heads are twice as large.

3.35* Head pointed and ovoid, shaft baluster shaped, point missing.
Length 33.5mm, diameter of head 9.7mm, max diameter of shaft 5.7mm.
SF 7014, F 3003, demolition rubble, 1750+.

3.36* Shallow groove on head reflects inner curve of bone. Shaft baluster shaped.
Length 80.7mm, diameter of head 10.7mm, max diameter of shaft 5.0mm.
SF 5223, A 2214, backfill of ditch, 450–500.

Type 5. Pins with separate spherical heads

Only the heads of this type have been found.

3.37 Quadrant of spherical pinhead with socket for shaft.
Length 10.3mm, width 8.4mm, max thickness 4.2mm.
SF 3181, E 1036, occupation surface, 450–600.

3.38* Spherical pinhead with socket for separate shaft.
Diameter 10.0mm.
SF 8029, F 3139, demolition level, 1750+.

Type 6. Pins with bead-and-reel heads

3.39* Head a single reel beneath a spherical bead. The shaft is tapering and highly polished. The point and a vertical section of shaft are missing.
Length 46.1mm, diameter of head 6.5mm, max diameter of shaft 6.3mm.
SF 14136, P 5018, make-up dump from the

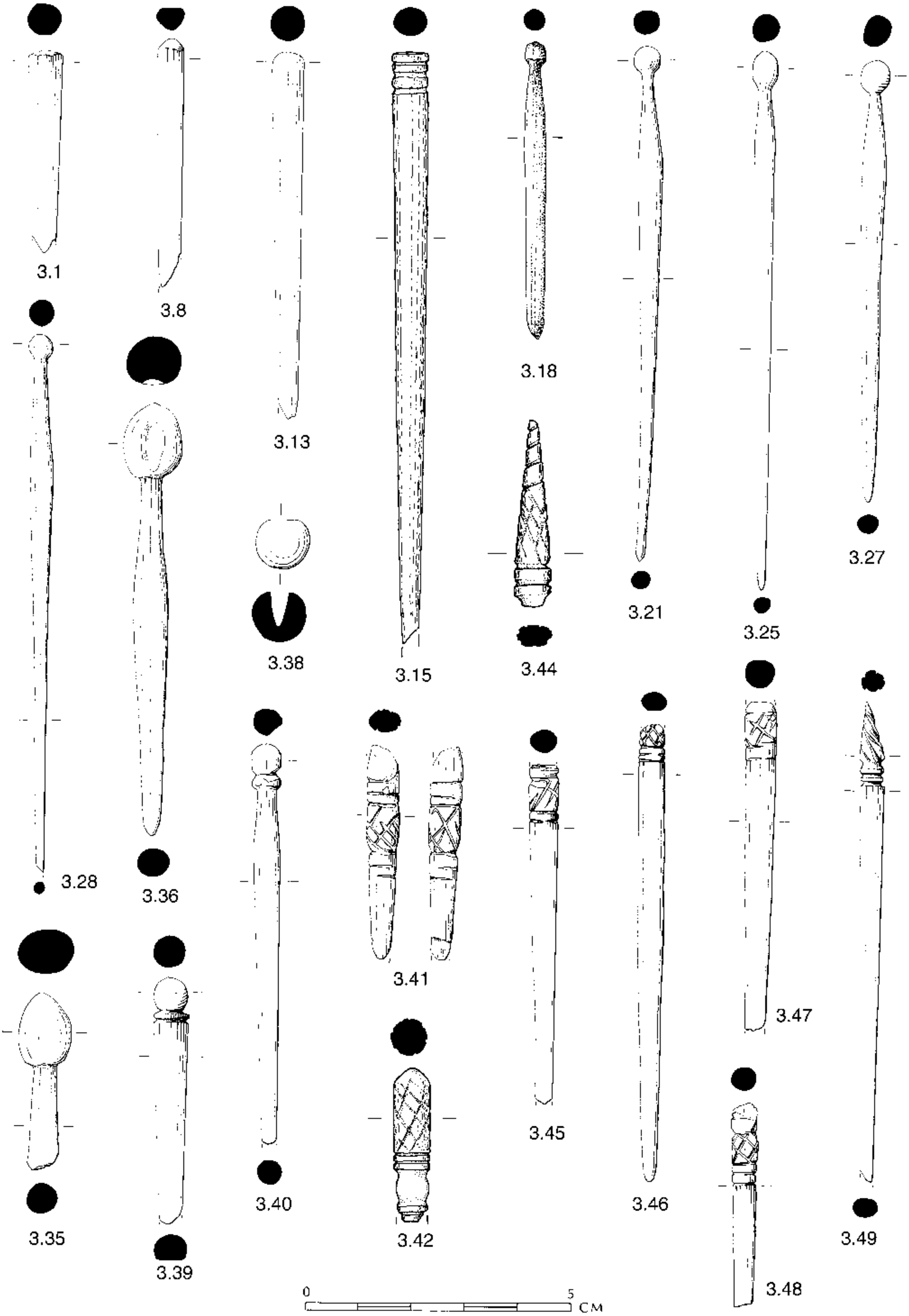


Fig 3.1 Bone pins

interior of the tower, taken from the destruction level within the Roman city, *c* 450.

3.40* Ovoid bead head with roughly worked single reel below. Shaft baluster shaped, point missing.
Length 75.7mm, diameter of head 5.9mm, max diameter of shaft 4.3mm.
SF 12122, M 4846, robber-trench fill, 275–450.

Type 7. Miscellaneous pins

These have decorated heads, mostly with grooves and latticework, and tapering shafts.

3.41* Flattened and tapering, decorated with crude lattice between six incised lines.
Length 39.3mm, diameter 6.3mm.
SF 3086, E 1040, secondary early Byzantine occupation surface, 500–600.

3.42* Cylindrical head decorated with incised lattice above bead and two reels.
Length 29.4mm, diameter 6.5mm.
SF 3094, E 1024, occupation level, 450–600.

3.43 Slight baluster shape. Upper end decorated with double discontinuous incised lines with crude lattice between.
Length 83.0mm, max diameter 6.0mm.
SF 4324, D 542, occupation level, 450–600.

3.44* Pinhead with a flattened cone shape. Two incised lines below crude lattice, above which is an incised spiral.
Length 34.5mm, width 6.9mm, thickness 4.0mm.
SF 5140, A 2128, backfill of late Roman defensive ditch, *c* 450.

3.45* Broken pinhead decorated with crude lattice above two incised grooves. Tapering shaft, tip burnt.
Length 63.8mm, max diameter 5.6mm.
SF 4625, D 665, levelling dump deposit, 250–350.

3.46* Incomplete head with incised lattice above three incised lines. Shaft flattened, point burnt.
Length 85.6mm, max diameter 5.0mm.
SF 4621, D 665, levelling dump deposit, 250–350.

3.47* Flattened tapering shaft decorated with three incised lines and lattice.
Length 61.4mm, max diameter 5.7mm.
SF 14047, F 3139, demolition level, 1750+.

3.48* Incomplete head decorated with four incised lines and lattice.
Length 38.5mm, max diameter 4.7mm.
SF 10128, K 4402, demolition debris, 1750+.

3.49* Head a flame-like spiral above two reels. Shaft flattened and tapering.
Length 89.8mm, max width of shaft 4.7mm, thickness of shaft 3.8mm.
SF 10239, K 4512, make-up deposit, 300–450.

3.50* Head ovoid decorated with lattice above a double reel, bead and single reel. Shaft tapering.

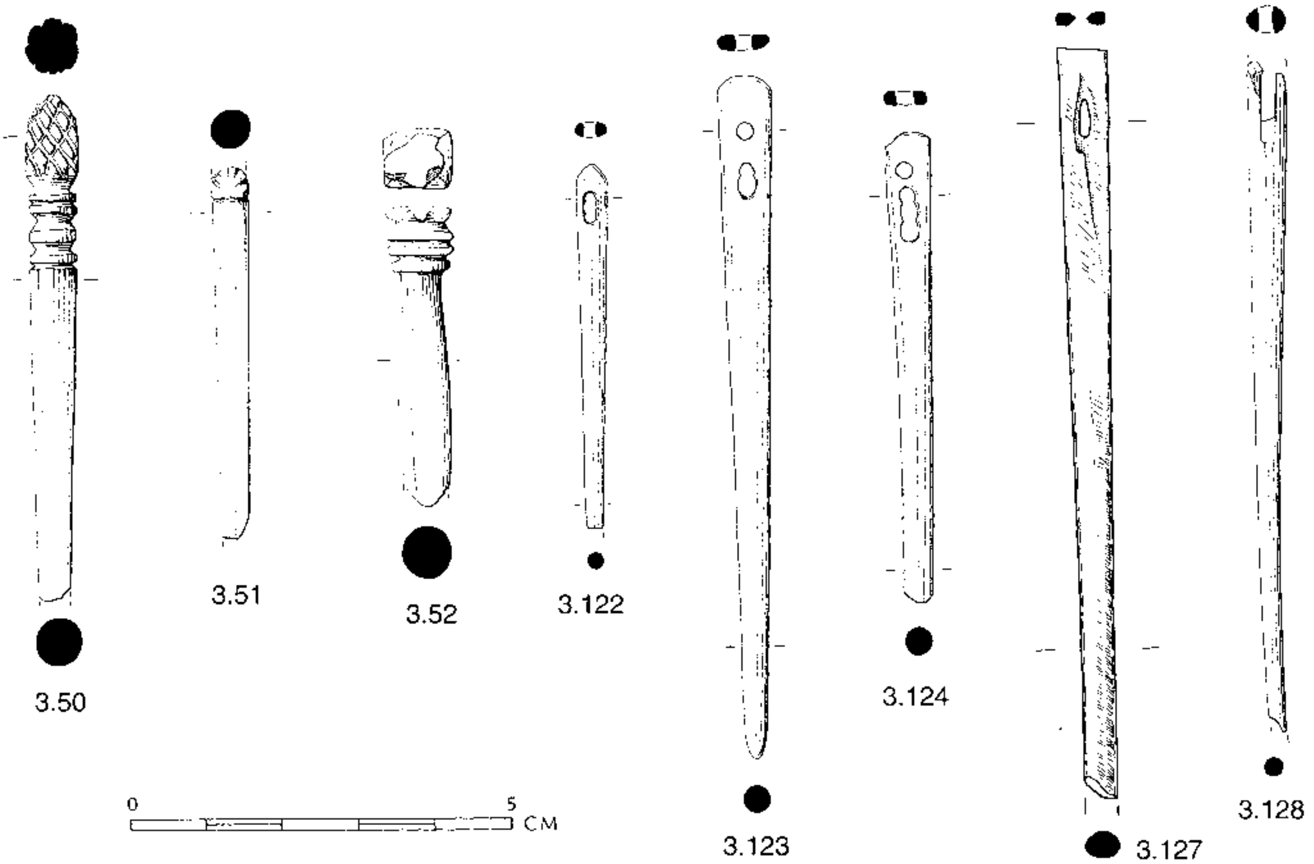


Fig 3.2 Bone Pins and Needles

Length 66.8mm, diameter of head 6.4mm, diameter of shaft at break 4.2mm.
SF 8301, F 3384, backfill of robber-trench, 1750+.

3.51* Tapering shaft with incised line and beginning of decoration.
Length 49.1mm, max diameter 4.8mm.
SF 12231, M 4896, occupation surface, 1750+.

3.52* Thick baluster shaft topped by a reel, above which is a cuboid, incised with a horizontal line. The top surface of the head is decorated with a crude cross-shaped finial.
Length 40.2mm, width of head 9.0mm, thickness of head 8.6mm, max diameter of shaft 6.5mm.
SF 10158, K 4430, robber-trench fill, 1750+.

PIN SHAFTS AND POINTS

Probably all these belong to the types described above.

Type 3. Baluster shaped shafts

3.53 Length 46.2mm, max diameter 3.6mm.
SF 4137, D 446, wall tumble, 1750+.

3.54 Length 63.4mm, max diameter 4.6mm.
SF 4183, D 451, tumble of stones probably from a wall outside the area, 1750+.

3.55 Length 49.1mm, max diameter 4.2mm.
SF 7200, F 3047, robber-trench fill, 1750+.

3.56 Point reworked. Length 60.9mm, max diameter 4.5mm.
SF 3215, E 1036, occupation surface, 450–600.

3.57 Length 79.3mm, max diameter 3.7mm.
SF 5231, A 2187, 400.

3.58 Length 63.0mm, max diameter 4.5mm.
SF 10140, K 4463, post-medieval robbing debris, 1750+.

3.59 Length 52.5mm, max diameter 4.2mm.
SF 10202, K 4432, robber-trench fill, 1750+.

3.60 Length 81.8mm, max diameter 3.5mm.
SF 6602, C 4110, backfill of ditch, 300–400.

3.61 Length 56.5mm, max diameter 3.8mm.
SF 10213, K 4457, pit-fill, 1750+.

3.62 Length 34.6mm, max diameter 4.0mm.
SF 12129, M 4848, dump deposit, 350–450.

3.63 Length 81.2mm, max diameter 4.2mm.
SF 10240, K 4511, dump, 250–350.

3.64 Length 45.7mm, max diameter 3.6mm.
SF 10227, K 4509, make-up level, 300–450.

Type 4. Large baluster shaft

3.65 Point burnt.
Length 90.2mm, max diameter 7.3mm.
SF 6522, C 4033, backfill of ditch, 450–500.

Type 7. Tapering shafts

3.66 Indication of decoration at top. Length 59.0mm, max diameter 4.9mm, Min diameter 3.6mm.
SF 3026, E 1018, robber-trench, fill, 1750+.

3.67 Shaft flattened. Single groove at top.
Length 55.7mm, max diameter 5.6mm.
SF 4167, D 451, tumble of stones probably from a wall outside the area, 1750+.

3.68 Shaft flattened. Length 38.7mm, max diameter 4.8mm.
SF 3090, E 1039, pit-fill, 450–600.

3.69 Shaft flattened. Length 35.1mm, width 2.0mm, thickness1.2mm.
SF 1253, E 1031, levelling dump of rubble and clay, 450–600.

3.70 Length 61.4mm, max diameter 5.8mm.
SF 2553, B 275, backfill of ditch, 250–350.

3.71 Length 31.6mm, max diameter 3.3mm.
SF 2665, B 338, fill of ditch, 200–300.

3.72 Point off centre. Length 35.0mm, max diameter 3.5mm.
SF 5188, A 2156, backfill of late Roman defensive ditch, 450–600.

3.73 Length 73.7mm, max diameter 4.3mm.
SF 4578, D 654, pit-fill, 400–450.

3.74 Length 33.8mm, max diameter 2.5mm.
SF 4598, D 659, destruction deposit within the ‘early building’, 250–350.

3.75 Length 31.2mm, max diameter 3.7mm.
SF 4603, D 659, destruction deposit within the ‘early building’, 250–350.

3.76 Length 30.30mm, max diameter 3.6mm.
SF 4662, D 676, 175–250.

3.77 Shaft flattened. Length 40.0mm, max diameter 4.0mm.
SF 10030, K 4405, topsoil, 1750+.

3.78 Highly polished, point burnt. Length 59.4mm, max diameter 2.3mm.
SF 5307, A 2260, pit-fill containing domestic rubbish, 100–130.

3.79 Length 57.5mm, max diameter 4.6mm. Shaft flattened.
SF 14073, M 4803, topsoil, 1750+.

3.80 Length 29.0mm, max diameter 2.6mm.
SF 10082, K 4430, robber-trench fill, 1750+.

3.81 Length 20.0mm, max diameter 3.2mm.
SF 10096, K 4424, robber-trench fill, 1750+.

3.82 Highly polished.
Length 39.1mm, max diameter 3.6mm.
SF 10142, K 4463, post-medieval robbing debris, 1750+.

3.83 Length 36.8mm, max diameter 4.6mm.
SF 10129, K 4405, topsoil, 1750+.

3.84 Length 32.7mm, max diameter 3.2mm.
SF 10214, K 4480, Slav robber pit, 800–1000.

3.85 Two incised lines at upper end.
Length 27.3mm, max diameter 5.6mm.
SF 8211, F 3310, make-up deposit, 250–350.

3.86 Length 34.8mm, max diameter 3.2mm.
SF 8226, F 3321, make-up deposit, 250–350.

3.87 Length 29.3mm, max diameter 2.9mm.
SF 14301, P 5022, dump of destruction debris, 250–300.

3.88 Length 31.2mm, max diameter 2.5mm.
SF 10254, K 4516, rubbish, 250–350.

3.89 Length 21.9mm, max diameter 2.8mm.
SF 10242, K 4513, make-up, 250–350.

3.90 Length 26.7mm, max diameter 3.6mm.
SF 8305, F 3321, make-up deposit, 250–350.

3.91 Length 26.7mm, max diameter 3.6mm.
SF 8737, F 3321, make-up deposit, 250–350.

3.92 Length 24.9mm, max diameter 3.3mm.
SF 3356, E 1222, dump layer, 450–500.

3.93 Length 32.0mm, max diameter 5.2mm.
SF 1024, A -, topsoil, 1750+.

3.94 Length 33.1mm, max diameter 4.6mm.
SF 14480, C 89, rubble spread, 1750+.

3.95 Length 22.4mm, max diameter 4.4mm.
SF 14762, P 5051, make-up taken from destruction level within Roman city, *c* 450.

3.96 Length 26.1mm, max diameter 3.6mm.
SF 14761, R 5218, make-up deposit laid during construction of the tower, 450–500.

3.97 Length 24.1mm, max diameter 3.6mm.
SF 15076, C 5303, backfill of ditch, 400–450.

3.98 Shaft flattened.
Length 18.5mm, width 4.4mm, thickness3.4mm.
SF 15078, C 5303, backfill of ditch, 400–450.

3.99 Length 20.8mm, max diameter 2.1mm.
SF 2663, B 336, fill of ditch cutting the Roman road, 175–250.

3.100 Length 19.8mm, max diameter 2.2mm.
SF 4606, D 661, destruction deposit, 375–450.

3.101 Natural foramen in shaft. Single reel at upper end.
Length 49.0mm, max diameter 5.3mm.
SF 14147, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

Straight shafted pins

It is not clear to which pin types these shafts belong although the presence of incised lines and grooves suggest that they are probably Type 7.

3.102 Double incised line at upper end.
Length 89.6mm, diameter 4.3mm.
SF 4337, D 554, occupation surface, 450–600.

3.103 Double incised line at upper end.
Length 20.3mm, diameter 3.1mm.
SF 3168, E 1024, occupation level, 450–600.

3.104 Length 24.9mm, diameter 2.9mm.
SF 3170, E 1024, occupation level, 450–600.

3.105 Laminating.
Length 23.2mm, diameter 3.8mm.
SF 3120, E 1024, occupation level, 450–600.

3.106 Length 27.9mm, diameter 2.9mm.
SF 4586, D 657, external surface, 250–350.

3.107 Natural foramen in point.
Length 38.8mm, diameter 3.2mm.
SF 4631, D 667, dump deposit of industrial waste, 175–250.

3.108 Length 26.6mm, diameter 3.2mm.
SF 5294, A 2251, collapsed remains of a hearth, 450–600.

3.109 Natural foramen in point.
Length 28.5mm, diameter 4.3mm.
SF 14046, F 3088, spread of robbing debris, 1750+.

3.110 Length 28.8mm. diameter 5.4mm.
SF 4686, D 681, occupation surface, 200–300.

3.111 Double groove at upper end.
Length 25.2mm, diameter 5.4mm.
SF 8083, F 3001, topsoil, 1750+.

3.112 Length 32.8mm, diameter 2.4mm.
SF 10171, K 4429, robber-trench fill, 1750+.

3.113 Point off centre and burnt.
Length 45.3mm, diameter 3.5mm.
SF 6633, C 4135, fill of pit, 100–175.

3.114 Shaft trapezoid in section. Point off centre.
Length 39.2mm, width 4.2mm, thickness3.8mm.
SF 12175, M 4866, destruction level, 200–250.

3.115 Length 33.5mm, diameter 4.2mm.
SF 14443, P 5014, make-up dump within tower, *c* 450.

3.116 Length 22.5mm, diameter 4.4mm.
SF 14530, B 275, backfill of ditch, 250–350.

3.117 Flattened shaft with two parallel discontinuous grooves.
Length 18.0mm, width 4.9mm, thickness 2.9mm.
SF 15075, C 5302, fill of ditch, 300–400.

3.118 Point off centre.
Length 20.9mm, diameter 4.4mm.
SF 15077, C 5303, backfill of ditch, 400–450.

3.119 Length 14.7mm, diameter 2.0mm.
SF -, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

3.120 Burnt.
Length 32.0mm, diameter 3.4mm.
SF -, F 3151, post-hole fill, 800–1000.

NEEDLES (Fig 3.2)

The needles fall into two groups: those with drilled eyes and those with cut or chiselled eyes. Biró (1987) noted that traces of metal or wire have been found in the eyes of some needles which suggests that some were not used for sewing cloth. However, as this was not the case with any of the finds from Nicopolis, it is here assumed bone shafts with eyes are all common needles.

3.121 Single eye, drilled from each side.
Length 27.8mm, width of head 5.0mm, thickness of head 3.3mm, diameter of eye 2.1mm.
SF 12061, M 4834, building collapse, 1750+.

3.122* Eye formed by two drill holes which do not overlap. Head pointed.
Length 48.1mm, width of head 4.0mm, thickness of head 2.0mm, diameter of eye 1.7mm, diameter of shaft 2.4mm.
SF 11034, C 5309, fill of cut for propugnaculum, 300–400.

3.123* Head flattened, pierced by three drilled holes the

lower two overlapping to form one eye. The lowest of the three is made by a larger drill than the upper two. The shaft is stout with a natural fissure on one side. Point burnt.
Length 90.0mm, width of head 7.3mm, thickness of head 1.9mm, diameter of eyes 2.5mm and 1.9mm, max diameter of shaft 5.7mm.
SF 4605, D 661, destruction deposit, 375–450.

3.124* Head flattened, pierced by four drilled holes, three overlapping. Point missing.
Length 62.2mm, width of head 5.8mm, thickness of head 1.9mm, Diameter of eye 2.0mm, diameter of end of shaft 3.4mm.
SF 4555, D 640. occupation level, 350–400.

3.125 Broken through drilled eye.
Length 29.2mm, width of head 5.7mm, thickness of head 2.4mm.
SF 14541, C 123, make-up deposit within the cobbled roadway, 300–450.

3.126 Broken through eye drilled from one side.
Length 48.7mm, width of head 5.0mm, thickness of head 2.5mm, Dia of shaft 3.4mm.
SF 4630, D 667, dump deposit of industrial waste, 175–250.

3.127* Shaft flattened. Bevelled eye cut by knife or chisel.
Length 99.2mm, width of head 6.8mm, thickness of head 1.4mm, Length of eye 5.4mm. max width of eye 1.3mm, diameter of end of shaft 4.5mm.
SF 2688, B 352, primary fill of pit, 100–130.

3.128* Rectangular eye cut from both sides, bevelled lower edge. Point missing.
Length 88.3mm, width at eye 5.1mm.
SF 4547, D 640. occupation level, 350–400.

3.129 Broken through eye, which is off-centre and wider on one side. Point missing.
Length 84.2mm, width of head 6.4mm, thickness of head 2.7mm, max diameter of eye 2.1mm, diameter of end of shaft 2.7mm.
SF 3001, C 57, gateway, 175.

3.130 Broken through eye of equal width on both sides. Point missing.
Length 67.5mm, max width 5.0mm, thickness 2.9mm, diameter of eye 1.3mm.
SF 5175, A 2147, backfill of defensive ditch, 450–500.

3.131 Broken through eye, point missing.
Length 53.8mm, max width 4.5mm, thickness 3.0mm.
SF 10228, K 4508, floor level within the ‘early building,’ 250–450.

3.132 Broken through eye, point missing.
Length 73.0mm, width of head 5.3mm, thickness of head 3.7mm, max diameter of shaft 4.6mm.
SF 8225, F 3321, make-up deposit, 250–350.

3.133 Broken through eye, point missing.
Length 23.5mm, width 5.0mm, thickness 2.6mm, width of eye 2.1mm.
SF 15073, E 1036, occupation surface, 450–600.

COMBS (Fig 3.3)

Only four combs were found. Three are typical composite combs, whereas the fourth is an unusual type and may not have been used as an ordinary comb.

3.134* End connecting plate broken at iron rivet. Undecorated, but connecting plate marked with notches from tooth cutting. A similar comb comes from Iatrus (*Iatrus* II, 190, Taf. 66) and is dated here to the 6th/7th century.
Length 26.7mm, width 47.4mm, thickness 3.8mm. Length of connecting plate 16.6mm, width 15.2mm, thickness 4.0mm.
SF 2114, B 241, cobbled road surface, 300–450.

3.135* Fragment of antler composite double-sided comb. The connecting plate is decorated with incised lines and triple ring-and-dot motif.
Length 31.6mm, width 17.7mm, thickness 7.6mm.
SF 6499, C 4013, backfill of late Roman ditch, 450.

3.136* End segment of an antler composite double-sided comb. The connecting plate is missing, but the iron rivet remains.
Length 17.0mm, width 28.1mm, thickness 4.0mm.
SF 14677, P 5051, make-up taken from destruction level in Roman city, *c* 450.

3.137* Single sided antler comb with ansate top. Broken at root of teeth, complete in width, sides smooth and polished. No parallel has been found for this object. It may be a section of composite comb, but seems closer to Anglo-Saxon miniature combs (MacGregor 1985, fig 44).
Length 41.4mm, width 23.1mm, thickness 3.6mm.
SF 6358, C 126, cobbled roadway, 300–450.

SPOONS (Fig 3.3)

Only three were found. The first two are small, one with a round bowl, the other oval. The handle of a third would seem to be from a larger type. Also included here is a small cosmetic spoon or ear-pick.

3.138* Bone spoon with circular bowl. The broken shaft is decorated with three incised lines and crude lattice.
Length 56.5mm, width of bowl 12.7mm, thickness of bowl 1.8mm, max diameter of handle 5.0mm.
SF 14045, F 3139, demolition level, 1750+.

3.139* Bone spoon. The handle continues under the oval bowl, of which little remains. Single reel on handle below breakage point.
Length 28.6mm, width 14.4mm, thickness of bowl 2.7mm, diameter of handle 7.4mm.
SF 14712, P 5051, make-up taken from destruction level in Roman city, *c* 450.

3.140* Spoon handle broken at both ends. The shaft tapers and the wider end has a raised flattened

area with two parallel grooves. The narrow end has a rough bead terminal. The wider end is similar in arrangement to the junction of handle and bowl on 3.138.
Length 98.6mm, max diameter 7.1mm.
SF 4657, D 676, 175–250.

3.141* Cosmetic spoon. A flattened bowl is set at an oblique angle below a bead-and-reel, above which the shaft tapers to the point of breakage.
Length 55.7mm, max diameter 4.4mm.
SF 4366, D 558, destruction deposit within the ‘early building’, 350–450.

BOXES (Fig 3.3)

Cylindrical ivory and bone jars for cosmetics are common finds on Roman sites. For example, Biró (1987) describes three lids from Brigetio. The excavations at Nicopolis have produced a lid and a section from the wall of a jar.

3.142* Rectangular curved fragment. One end has a beaded rim with beading on the exterior. The other end has a rebate with flange. The exterior is highly polished, the inside roughly finished. Part of the wall of a circular box with separate base, into which the flange and rebate would fit.
Length 45.6mm, width 10.9mm, thickness 4.0mm.
SF 7102, F 3011, demolition level, 1750+.

3.143* Turned bone box lid. The upper surface is convex with a central large hole. The lower surface has a concave rim and the central hole rebated. The hole is to take a separate knob or handle.
Diameter 42.3mm, thickness 5.0mm, diameter of hole 13.8mm above, 10.9mm below.
SF 5276, A, u/s.

BEADS (Fig 3.3)

Two beads, one of bone and the other of antler, were found and possibly a third. The first is finely made, but the second is much cruder.

3.144* Cylindrical antler bead, pierced off centre, decorated with three incised lines. Saw marks at wither end.
Length 10.6mm, diameter 5.8mm.
SF 12283, M 4915, dump/accumulation layer, 350–450.

3.145* Rectangular bead utilising natural bone cavity. Decorated on each side with three crude single ring-and-dot motifs.
Length 30.0mm, width 9.8mm, thickness 9.1mm.
SF 14733, C, u/s.

DICE (Fig 3.3)

3.146* One angle is rounded. The characters are marked by single ring-and-dot motifs. Opposite faces add up to seven.
Length 10.6mm, width 11.5mm, thickness 9.3mm.
SF 2614, B 319, pit-fill, 100–130.

3.147* Opposite faces add up to seven.
Length 7.7mm, width 6.6mm, thickness 6.0mm.
SF 14680, P 5051, make-up taken from destruction level in Roman city, *c* 450.

3.148* Broken through faces five and six, and three and four. The characters are marked by double ring-and-dot motifs.
Length 9.0mm, width 7.2mm, thickness 4.9mm.
SF 14012, A, u/s.

3.149* The characters are marked by double ring-and-dot motifs. Opposite faces add up to seven.
Length 12.2mm, width 12.4mm, thickness 9.0mm.
SF 4063, D 426, destruction level, 1750+.

COUNTERS (Fig 3.4)

Five different kinds of counters and gaming pieces were found. The first group are flat and turned with grooves on the upper side. There are two cylindrical ‘pawns’ of antler, two plano-convex round counters, one oval plano-convex counter and one rectangular plano-convex piece.

3.150* Turned bone counter with three obliquely set grooves and central dot on upper side, bevelled edges and lower side smooth.
Diameter 17.9mm, thickness 3.0mm.
SF 5302, A 2277, primary pit-fill, 100–130.

3.151 Turned bone counter. (Measurements not available). SF -, u/s.

3.152* Turned cylinder of antler. On the base the turning point is central, the top has an off-centre turning point with four stepped eccentric circles. Pale brown in colour.
Length 13.8mm, diameter 13.4mm.
SF 6662, C 4210, occupation surface, undated.

3.153* Turned cylinder of antler. The top is decorated with two incised circles around the central dot. There is a natural groove on the side. The base is well finished apart from a tag on one side, where it appears to have been broken off. Dark grey in colour. MacGregory (1985, 137, fig 71r) describes these as pawns.
Length 13.1mm, diameter 12.4mm.
SF 12196, M 4883, topsoil,1750+.

3.154* Bone counter, upper surface convex and highly polished, lower surface flat.
Diameter 19.3mm, thickness 5.7mm.
SF 10161, K 4405, topsoil, 1750+.

3.155* Bone counter. Turned, upper surface convex, lower flat. Incomplete and laminating.
Diameter 29.8mm, thickness 7.3mm.
SF 12240, M 4906, abandonment build-up, 450–600.

3.156* Elongated oval convex counter of smoothed rib.
Length 38.1mm, width 16.0mm, thickness 5.2mm.

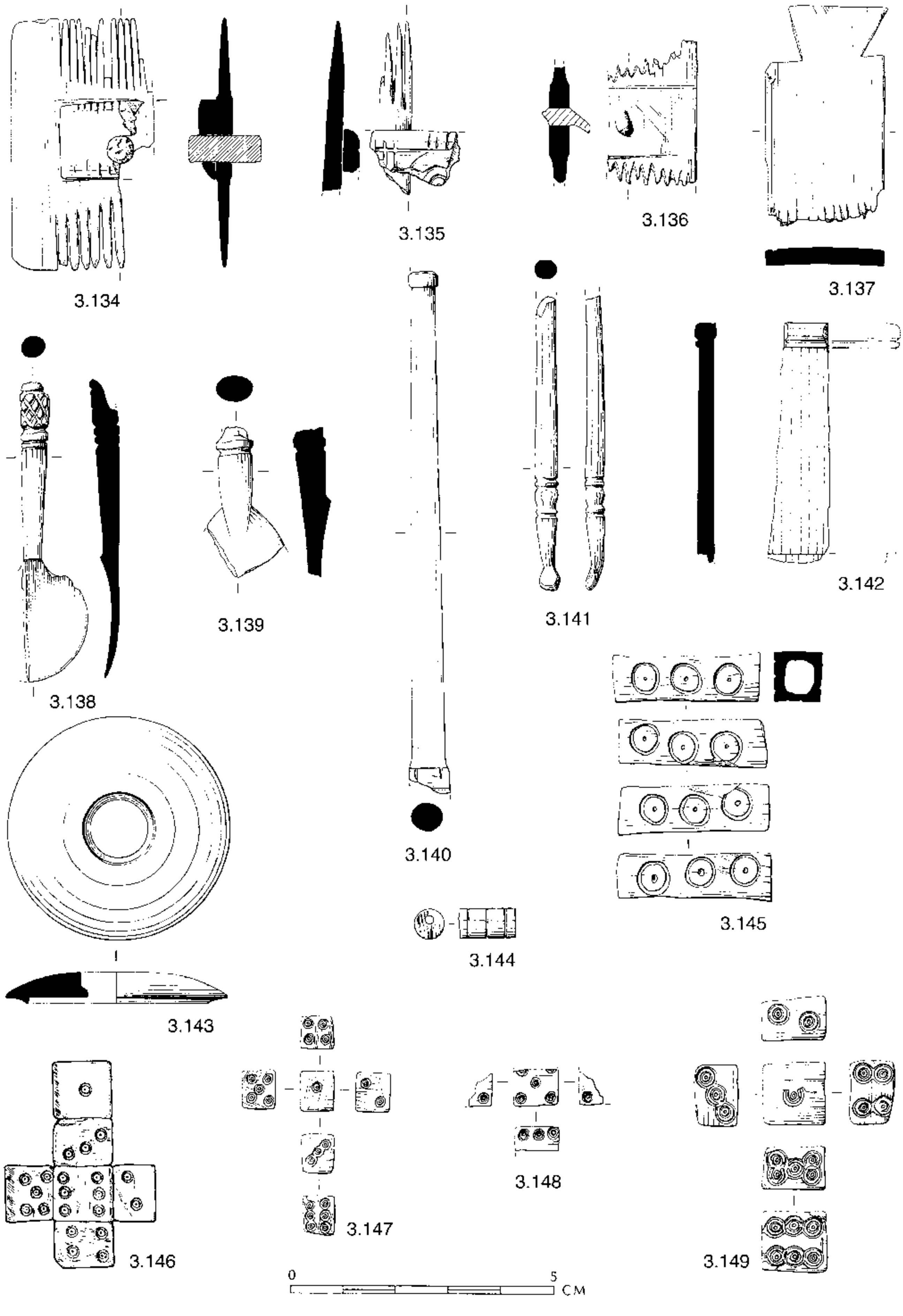


Fig 3.3 Bone Combs Spoons, Boxes, Beads and Dice

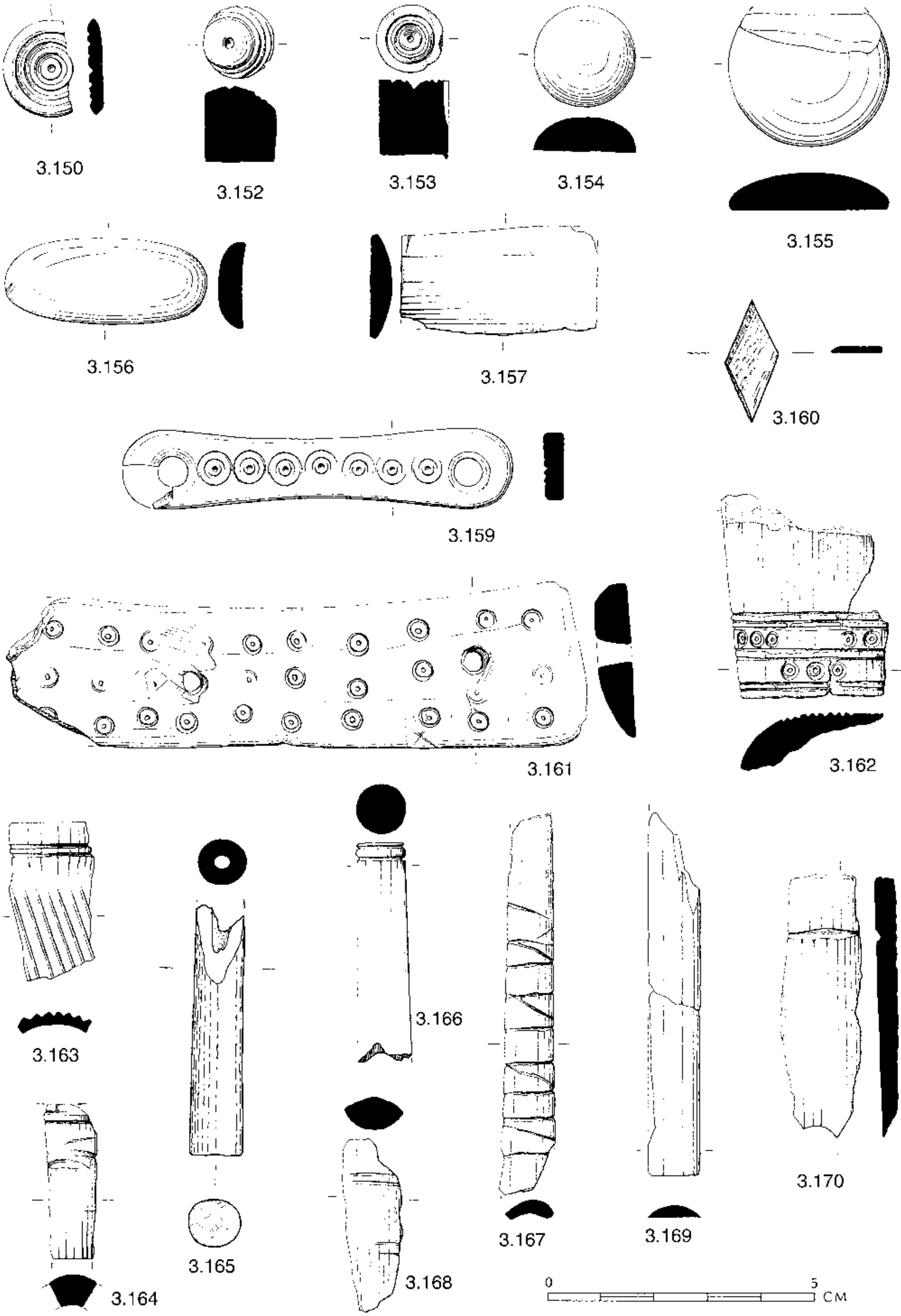


Fig 3.4 Bone Counters, Mounts, Handles and Plano-Convex Strips

SF 14140, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

3.157* Rectangular counter of smoothed bone with convex surface. Rough rasp marks on the lower surface. Possibly part of a facing plate from a knife handle.
Length 36.8mm, width 19.8mm, thickness 4.3mm.
SF 12214, M 4887, topsoil, 1750+.

MOUNTS (Fig 3.4)

These three items have three different kinds of fitting. The first would seem to have been glued onto a surface, the second fixed with pegs and the third inlaid into a surface.

Both 158 and 160 may well be inlays for the decoration of furniture. For parallels cf, Bíró 1994, 57 and cat. Nos. 580–10. Also, 3.159 is more likely to have been a fastening for a pouch or purse (A.G. Poulter).

3.158 Semicircular, tapering beading, decorated with two grooves, one bearing traces of red paint. There is no sign of holes or pegs to attach the mount, but it could have been glued. MacGregor 1976, 13).
Length 25.3mm, max width 4.5mm, max thickness 2.7mm.
SF 5316, A 2011, occupation level, 450–600.

3.159* Bone, dumb-bell shaped mount with a hole at each end for attachment. Decorated with double ring-and-dot motifs.
In size, form and decoration, this strip of bone is exactly paralleled by a find from Golemanovo Kale which is interpreted as a fastening for bag or purse. Bone objects of this form are common early Byzantine finds in the region (Uenze 1992, D.263, taf.132.4 and taf.12.13, and see 194–5). Note that this example from Nicopolis also dates to the early Byzantine period (A.G. Poulter).
Length 73.2mm, width 14.9mm, thickness 4.3mm.
SF 13518, S 5285, fill of timber slot, 450–500.

3.160* Lozenge shaped piece of polished rib for use as inlay.
Length 23.2mm, width 10.0mm, thickness 1.4mm.
SF 2504, B 248, road surface, 300–450.

HANDLES (Fig 3.4)

The handles are of two basic types. The first are riveted together enclosing the tang, the second is a hollow tube into which the tang is wedged.

3.161* One convex plate of a two piece curved handle of antler. The surface is smoothed and decorated with rows of three single ring-and-dot motifs. Two rivet holes pierce the plate, the motifs moving to accommodate one of them. The blade end is broken.
Length 109.4mm, max width 30.5mm, thickness 9.3mm.
SF 2698, B 344, fill of ditch cutting roadway, 200–300.

3.162* Curved fragment of antler handle decorated with parallel grooves alternating with bands of single ring-and-dot motifs in groups of three.
Length 38.6mm, width 29.6mm, thickness 8.3mm.
SF 1222, C 30, abandonment build-up in building, 1750+.

3.163* Fragment of finely worked bone handle. Below a double incised line and indent, spiral fluting.
Length 29.6mm, width 16.9mm, thickness 3.3mm.
SF 14013, D 635, levelling deposit, 250–350.

3.164* Handle fragment of smoothed metapodial, decorated at one end with two parallel grooves, broken at the other end through a groove.
Length 29.3mm, width 9.3mm, thickness 5.4mm.
SF 15074, C 4215, soil accumulation/ destruction deposit, immediately over cobbled road, *c* 450.

3.165* Broken handle of ovicaprid metapodial. Smoothed and polished with indentation on upper end, possibly remains of the natural sulcus.
Length 46.7mm, diameter 9.8mm.
SF 5050, A 2014, occupation surface, 450–600.

3.166* Cylinder of antler, highly finished, with double groove at complete end.
Length 40.8mm, max diameter 10.3mm.
SF 8284, F, u/s.

PLANO-CONVEX STRIPS (Fig 3.4)

These objects may be either parts of two piece handles, though none have rivet holes, or else connecting plates from composite combs.

3.167* Section of metapodial with crude incised lattice.
Length 71.2mm, width 10.2mm, thickness 3.0mm.
SF 3084, E 1024, occupation level, 450–600.

3.168* Much abraded fragment with two pairs of incised parallel lines.
Length 32.5mm, width 10.8mm, thickness 5.8mm.
SF 2519, B 244. the cobbled road-surface, 300–450.

3.169* Smoothed bone.
Length 67.7mm, width 9.3mm, thickness 2.8mm.
SF 14504, B 280, fill of Roman ditch cutting the road, 250–350.

3.170* Piece of split rib with a transverse groove at one end, and another on the line of breakage. Length 48.7mm, width 15.0mm, thickness 4.1mm.
SF 10224, K 4405, topsoil, 1750+.

LOOPED HANDLES (Fig 3.5)

These items have parallels in glass and metal, examples in the three materials are exhibited together in the Intercisa museum. Biró (1987) suggests that the pinea on

the loop suggests a ritual function. The spiral decoration on the second object is reminiscent of twisted glass 'stirring' rods. The use of these objects remains conjectural. This category of find has more recently been interpreted as distaffs (Bíró 1994, cat. Nos. 851–2 and p.49–50). For another possible example, see below, no. 3.179 (A.G. Poulter).

3.171* Broken ring of bone, with crude pinea branching from it.
Length 32.1mm, width 21.4mm, thickness 3.0mm.
SF 10062, K, u/s.

3.172* Two pieces of the same object. The first is a straight shaft with continuous triple spiral incised lines. The second is the top of the shaft with the base of a loop. A similar object comes from Callatis (Preda 1980, P. XXIX).
Length 28.9mm, diameter 6.5mm; Length 35.3mm, diameter 6.5mm, width of head 9.6mm, thickness of head 5.4mm.
SF 49, A 23, cleaning level, u/s and SF 2203, A 1 topsoil, 1750+.

MISCELLANEOUS OBJECTS (Fig 3.5)

3.173* Bone peg. Tapering with distinct neck and flat head. A V-shaped notch is carved from the top of the shaft through the neck into the head.
Length 41.3mm, max diameter 7.1mm.
SF 3063, E 1031, levelling dump of rubble and clay, 450–600.

3.174 Worked fish vertebra. Cervical vertebra of Siluris glanis pierced centrally, with wear around the edges of the hole. Possibly an amulet.
Diameter 25.5mm, thickness 8.4mm, diameter of hole 5.3mm.
SF 4576, D 653, levelling dump, 400–450.

3.175* Antler ring. Antler burr pierced through with areas of wear on the inside. MacGregor (1985, 108, fig 61) proposes that it may have been believed that these objects possessed amuletic powers, as well as serving a practical purpose as buckles or purse rings.
Length 79.6mm, width 65.6mm, thickness 16.9mm.
SF 12344, M 4920, pit-fill, 350–450.

3.176* Spindle whorl. Upper side convex, lower side flat with two lightly incised circles.
Diameter 23.9mm, thickness 5.6mm, diameter of hole 5.0mm.
SF 4721, D, u/s.

3.177* Bow stiffener. Fragment of a bone stiffener from a composite bow, broken through the neck. See Rausing (1967).
Length 62.3mm, width 16.7mm, thickness 2.5mm.
SF 8057, F, u/s.

3.178* Toggle? Broken object with a bead between two reels, pierced by an off-centre hole towards one end. It may be a toggle or pin-head.
Length 15.4mm, width 6.7mm, thickness 5.5mm.
SF 14199, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

3.179* Figurine. Headless female figure in pudicitia pose, worked on both sides. A necklace is indicated by four drilled holes, her navel by another, and the drapery, held in an elongated hand, is decorated with two single ring-and-dot motifs. Biró (1987) describes pin-heads representing full human figures, the most common of which was Venus, the goddess posing naked while combing her hair or bathing. Two pin-heads of the third century from Intercisa shown in Visy (1977, Pl.17) have figures in the same pose as the Nicopolis example.
Apart from pins, female figures are also commonly found at one end of rods (with circular loops at the other) which may well have been distaffs (Bíró1994, cat. Nos. 851–2 and p. 35) (A.G. Poulter).
Length 49.6mm, width 14.5mm, thickness 5.3mm.
SF 12299, M 4925, silt build-up, 1750+.

3.180* Pin? Bone shaft with incomplete flattened head, into which two angled notches have been cut.
Length 48.0mm, width of head 5.7mm, thickness of head 2.9mm, diameter of shaft 3.6mm.
SF 15072, K 4515, rubbish deposit, 250–350.

3.181 Bead? Section of polished bone with smoothed ends. Originally tubular, it could have served as a bead or spacer.
Length 30.8mm, width 7.8mm, thickness 2.5mm.
SF -, A 2188, primary fill of destruction material in defensive ditch 2, *c* 450.

3.182* Bone ring. Section of metapodial smoothed inside and out, possibly part of a bone hinge.
Length 19.6mm, diameter 25.1mm.
SF 6470, C 4007, topsoil, 1750+.

3.183* Pin beater? Long cupped scoop of very pale, highly polished antler. Biró (1987) interprets a similar object as a 'spinning tool.' It resembles pin beaters described by MacGregor (1985).
Length 47.3mm, width 14.3mm, thickness 4.4mm.
SF 3324, E 1189, pit-fill, 400–450.

3.184 Needle? Roughly worked shaft with spatulate head. Perhaps an unfinished needle or cosmetic applicator.
Length 46.3mm, width of head 8.0mm, thickness of head 1.8mm, diameter of shaft 5.6mm.
SF 10187, K 4488, collapsed rubble, 1750+.

3.185* Pierced metacarpal. Ovicaprid distal metacarpal with a drilled hole. The hole is off-centre and on the posterior surface it is broken through. The bone has been scraped clean. Purpose unknown.
Length 94.7mm, width of articulation 27.3mm, diameter of hole 4.4mm.
SF 12197, M 4883, topsoil, 1750+.

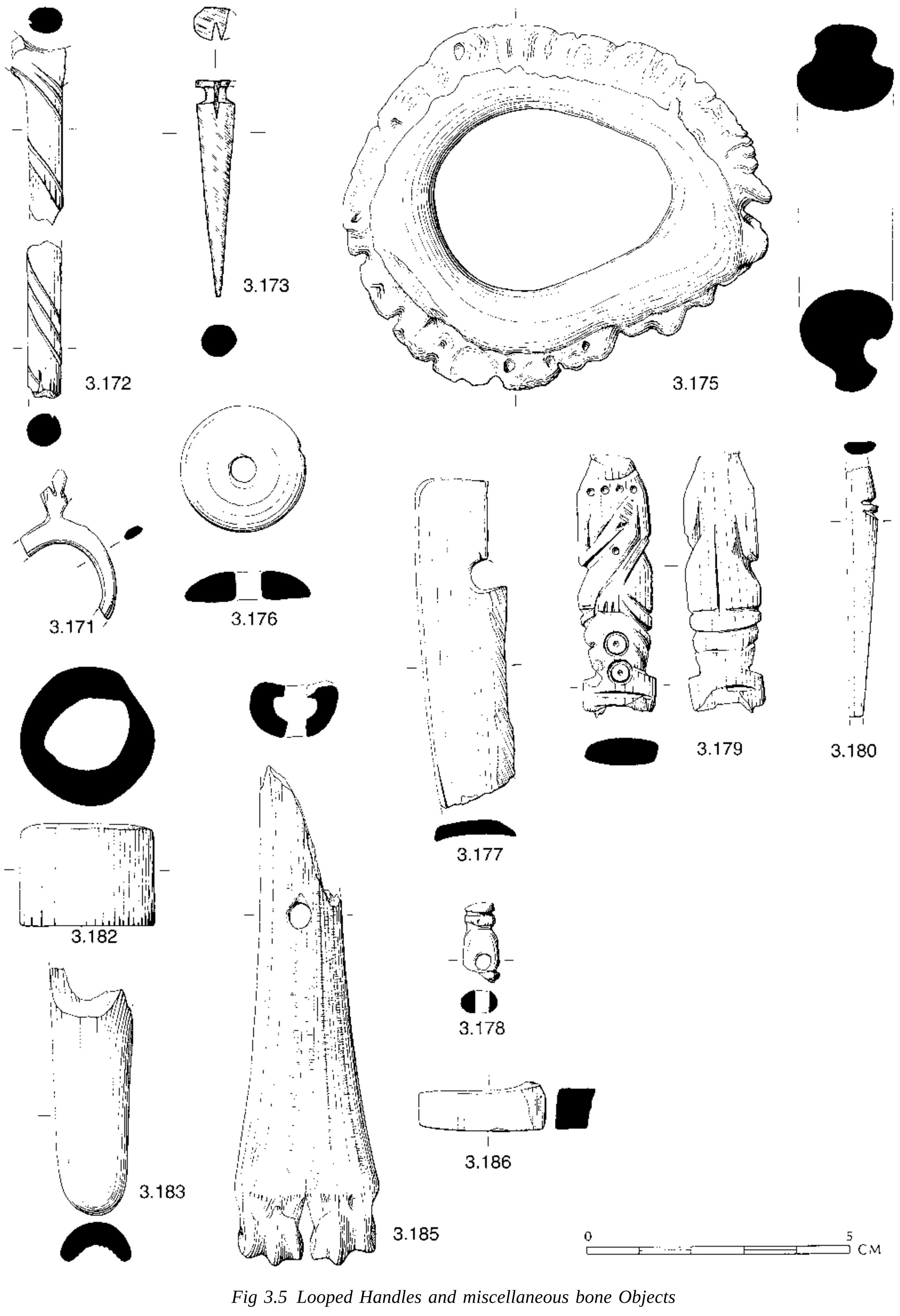


Fig 3.5 Looped Handles and miscellaneous bone Objects

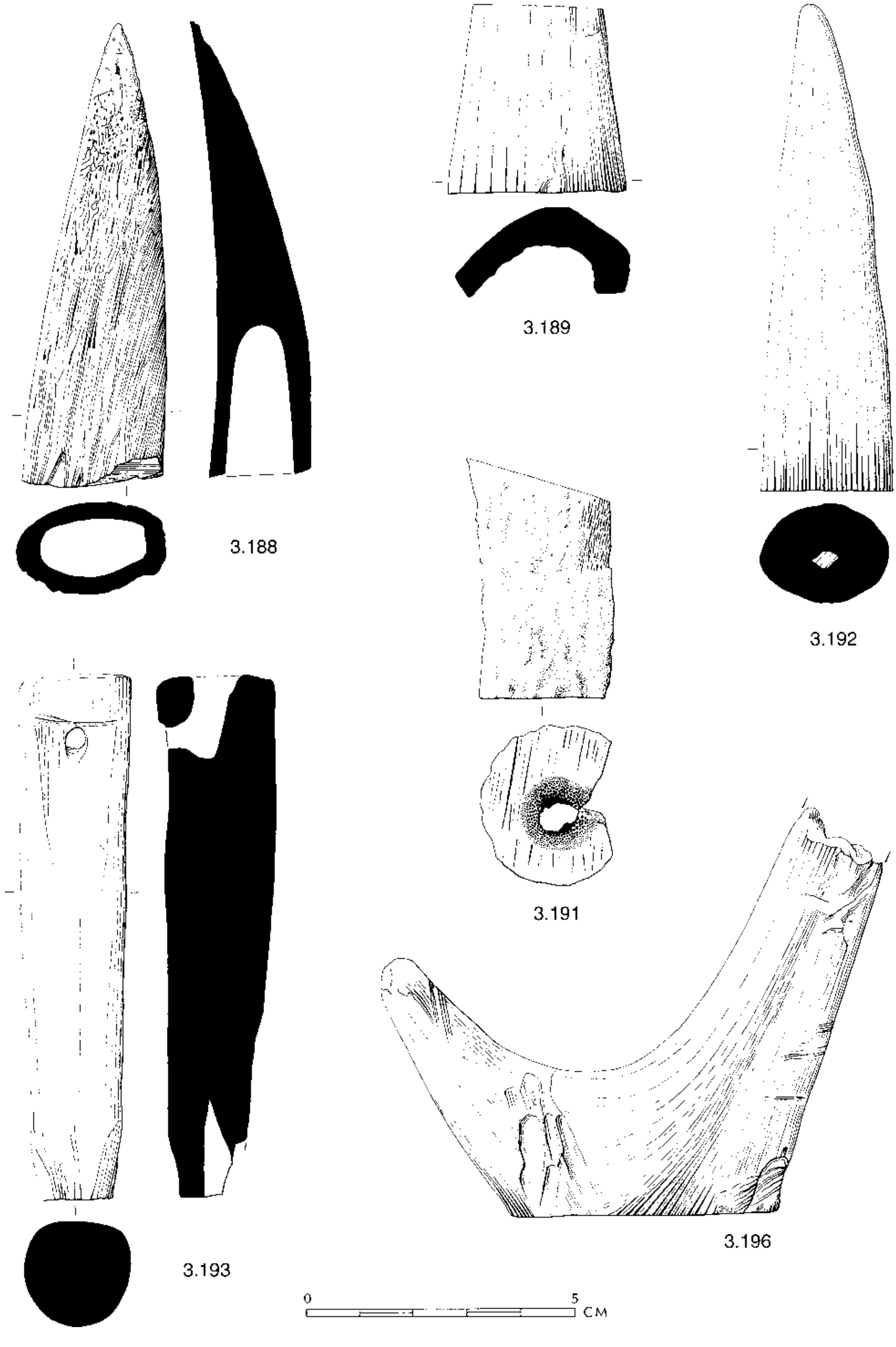


Fig 3.6 Unfinished Bone Objects and Antler

UNFINISHED BONE OBJECTS (Figs 3.5 and 3.6)

3.186* Quadrant of roughly worked metapodial with polished surface.
Length 24.7mm, width 7.6mm, thickness 8.2mm.
SF 2518, B 247, cobbled road, 300–450.

3.187 Fragment of metapodial with high polish and regular breaks. Worked?
Length 9.5mm, width 9.3mm, thickness 6.2mm.
SF 5247, A 2195, u/s.

3.188* Horn core of sheep, sawn through cavity.
Length 84.5mm, width 25.7mm, thickness 18.4mm.
SF 4580, D 656, dump deposit, 350–450.

3.189* Sawn and smoothed section of long bone.
Length 35.5mm, width 25.9mm, thickness 14.8mm
SF 14018, D 636, destruction deposit, 375–450.

3.190 Tough worked fragment of long bone.
Length 28.7mm, width 9.3mm, thickness 4.9mm.
SF 14590, F 3236, backfill of oven, 450–600.

ANTLER OBJECTS (Fig 3.6)

3.191* Incomplete section of antler beam, saw marks at each end, surface unworked.
Length 44.1mm, diameter 31.9mm.
SF 4297, D 458, rubble, 1750+.

3.192* Unworked tine sawn at base.
Length 91.2mm, width at base 25.1mm, thickness 19.2mm.
SF 4577, D 653, levelling dump, 400–450.

3.193* Roughly finished tine, the tip removed, a rough notch with pierced hole at the thicker end. Similar to a harness cheek piece from Colchester (Crummy 1983, 106, fig 109) but Biró (1987, 161) considers these objects to be tools used in the looping of rope when loading pack animals.
Length 98.2mm, max diameter 22.5mm.
SF 4684, D 677, fill of Roman ditch, 175–250.

3.194 Tine sawn off beam from two directions and then snapped. Smoothed.
Length 81.2mm, diameter of base 20.5mm.
SF 8137, F 3241, dissolved mudbrick, representing abandonment of the area, 400–450.

3.195 Split section of beam cut at one end. Unsmoothed.
Length 116.2mm, width 36.9mm, thickness 16.7mm.
SF 8138, F 3241, dissolved mudbrick, representing abandonment of the area, 400–450.

3.196* Beam and tine, sawn at base, cut marks on tine.
Length 72.1mm, width 51.4mm, thickness 2.5mm.
SF 8184, F 3292, clay make-up for a floor, 400–450.

3.197 Tine broken at base, dark chestnut in colour with high polish.
Length 53.2mm, max diameter 11.7mm.
SF 3329, E 1191, pit-fill, 400–450.

3.198 Tip of burnt tine.
Length 43.4mm, max diameter 10.9mm.
SF 1187, C 37, robber-trench fill, 1750+.

4

BEADS AND GLASS, JET AND SHALE JEWELRY

by

Anthony Roberts

The beads from Nicopolis come from a wide variety of contexts. The types represented were common throughout the Roman Empire and are comparable with examples described by Guido (1978) and Templemann-Maczynska (1985). Note that one copper alloy bead is included in the catalogue of metal finds (see above, 2.30). All finds are illustrated except for poorly preserved examples.

BEADS (Fig 4.1)

Simple spheroid beads of one colour. A type known throughout the Roman Empire (Temp. 1–18).

4.1* Large dark blue glass.
Length 10.2mm, diameter 12.5mm.
SF 6228, C 130, cobbled road, 300–450.

4.2* Cobalt blue glass.
Length 7.3mm, diameter 10.1mm.
SF 32, C 12, topsoil, 1750+.

4.3* Amber coloured glass. Thick white corrosion over surface.
Length 8.7mm, diameter 9.5mm.
SF 14051, C, u/s.

4.4* Green glass. Possibly a pendant rather than a bead (Temp. 83–87).
Length 6.7mm, diameter 7.7mm.
SF 4422, D 570, destruction deposit, 375–450.

4.5* Cobalt blue glass.
Length 2.3mm, diameter 3.5mm.
SF 14651, P 5051, make-up taken from destruction level in Roman city, *c* 450.

4.6 Opaque black glass.
Length 2.4mm, diameter 3.1mm.
SF 4963, D 471, wall collapse, 1750+.

4.7 Clear glass. Badly corroded and fragmentary.
Length 3.0mm, diameter 3.9mm.
SF 14443, M 4869, pit-fill, 350–450.

4.8 Iridescent black glass.
Length 17.0mm, diameter 29.0mm.
SF -, A 2076, destruction deposit, *c* 175.

Small segmented beads
(Guido, fig 37.1, Temp. 151–153)

4.9 Dark blue glass. The bead has been made by winding a rod of glass round a wire. It is now broken along the line of this spiral into six pieces.
Length 10.0mm, diameter 4.4mm.
SF 14653, P 5051, make-up taken from destruction level in Roman city, *c* 450.

4.10 Amber coloured glass.
Length 10.0mm, diameter 3.3mm.
SF 14704, P 5051, make-up taken from destruction level in Roman city, *c* 450.

4.11* Dark blue glass (Temp. 91).
Length 9.0mm, diameter 6.8mm.
SF 8215, F, u/s.

Cylinder shaped beads
(Guido, fig 37.5)

4.12* Amber coloured glass.
Length 4.0mm, diameter 7.4mm.
SF 3351, E 1126, make-up, 450–600.

4.13 Opaque turquoise glass.
Length 8.0mm, diameter 5.2mm.
SF 6626, C 4135, pit-fill, 100–175.

Long polygonal beads
(Guido, figs 37.8–10, Temp. 113–188)

4.14* Dark blue glass.
Length 12.lmm, diameter 3.3mm.
SF 14689, P 5051, make-up taken from destruction level in Roman city, *c* 450.

4.15* Clear glass covered in iridescent corrosion.
Length 17.9mm, diameter 3.4mm.
SF 14728, P 5052, make-up deposit, 100–300.

4.16* Opaque green glass.
Length 7.2mm, diameter 5.6mm.
SF 3285, E 1075, levelling deposit, 450–500.

Prism shaped beads
(Guido, fig 37.11)

4.17 Amethyst coloured glass. Regarded as a Sarmatian type.

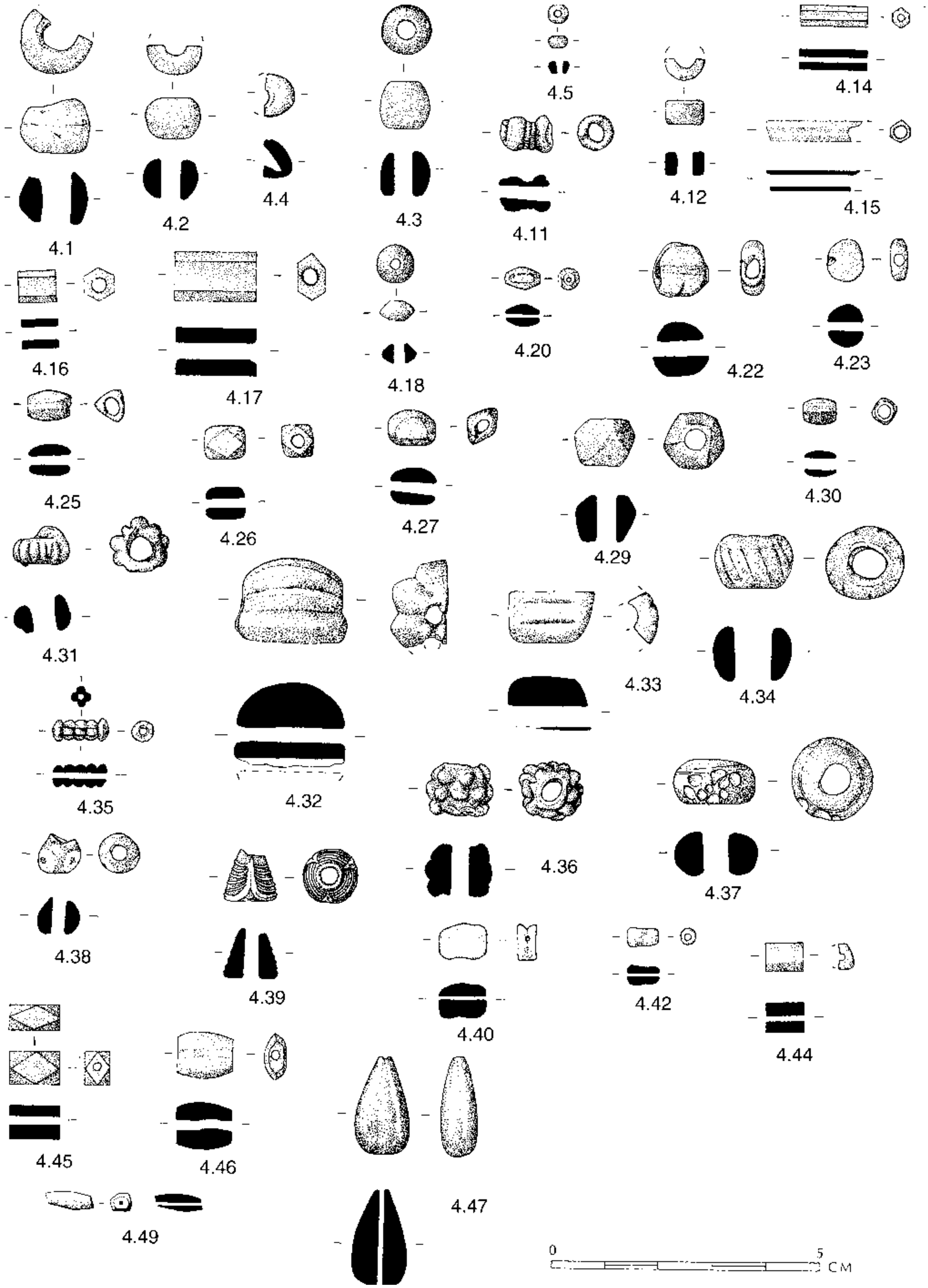

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Fig 4.1 Beads

Length 14.6mm, width 9.1mm, thickness 5.4mm.
SF 10154. K 4463, post-medieval robbing debris, 1750+.

Small biconical beads
(Guido, fig 37.12)

4.18* Dark blue glass.
Length 4.6mm, diameter 6.5mm.
SF 14325, P 5024 dump of destruction debris, 250–300.

4.19 Light blue glass, covered in iridescent corrosion.
Length 3.1mm, diameter 5.0mm.
SF 14717, P 5042, destruction layer, 250–300.

Long biconical beads
(Guido, fig 37.14)

4.20* Clear glass with gold foil.
Length 6.0mm, diameter 3.8mm.
SF 4330, D 542, occupation level, 450–600.

4.21 Clear glass with gold foil.
Length 5.0mm, diameter 2.5mm.
SF -, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

Round beads with flat sections
(Guido, fig 37.17)

4.22* Clear glass with lilac iridescence. The bead has been made by winding a rod around a wire and flattening it.
Length 9.9mm, width 10.6mm, thickness 4.6mm.
SF 14635, P 5051, make-up taken from destruction level in Roman city, *c* 450.

4.23* Opaque cobalt blue glass.
Length 7.0mm, width 7.9mm, thickness 2.9mm.
SF 14611, P 5050, make-up deposit taken from the destruction level within the Roman city, *c* 450.

Beads with triangular section

4.24 Pale blue glass.
Length 7.8mm, width 5.1mm.
SF 14697, P 5051, make-up taken from destruction level in Roman city, *c* 450.

4.25* Pale blue glass.
Length7.0mm, width 5.8mm, thickness 4.9mm.
SF 5238, A 2195, u/s.

Diamond faceted beads
(Guido, fig 37.20, Temp. 57)

4.26* Cobalt blue glass.
Length 7.5mm, width 6.0mm, thickness 5.9mm.
SF 2643, B 331, fill of ditch cutting roadway, 200–300.

4.27* Cobalt blue glass.
Length 8.5mm, width 7.8mm, thickness 6.7mm.
SF 8135, F 3241, dissolved mudbrick, representing abandonment of the area, 400–450.

4.28 Cobalt blue glass, corroded.
Length 6.8mm, width 5.8mm, thickness 4.9mm.
SF 4704, D 698, fill of pit, 130–150.

4.29* Clear glass. Each facet is a pentagon and the bead itself is roughly pentagonal.
Length 8.9mm, width 11.3mm, thickness 10.7mm.
SF 12, A 1, topsoil, 1750+.

Gadrooned beads
(Guido, fig 37.19, 21, 22)

4.30* Colourless? Barrel shape with shallow gadroons. Black corrosion and lilac iridescence.
Length 6.3mm, diameter 4.7mm.
SF 3281, E 1054, occupation surface , 450–600.

4.31* Black glass paste with chestnut ‘glaze’.
Length 7.0mm, diameter 9.8mm.
SF 14374, P 5048, make-up layer for tower floor, *c* 450.

4.32* Plano-convex, black glass paste with chestnut ‘glaze’. Originally with two piercings, one broken through.
Length 21.2mm, width 14.3mm, thickness 9.7mm.
SF 2674, B 280, fill of Roman ditch cutting the road, 250–350.

4.33* Pale blue glass elongated melon shape.
Length 15.0mm, width 9.4mm, thickness 3.8mm.
SF 5314, A 2277, primary pit-fill, 100–130.

4.34* Turquoise frit.
Length 10.5mm, diameter 13.8mm.
SF 12160, M 4861, demolition deposit, 200–250.

Decorated beads

4.35* Colourless glass enclosing gold foil. The bead is divided into five segments, the two outer being large and plain, the three inner divided horizontally to give a five-lobed cross section. (Guido. p.93).
Length 9.8mm, diameter 4.1mm.
SF 8191, F 3297, fill of robber cut, 250–350.

4.36* Straw coloured glass. The bead is made from an eight-lobed cane with three lobes on the length. This has been twisted to give an irregular raspberry-like form.
Length 9.8mm, diameter 11.0mm.
SF 10047, B 213, cobbled road, 300–450.

4.37* Opaque black glass inlaid with yellow paste. Annular bead with an irregular pattern of yellow dots.
Length 9.8mm, diameter 15.4mm.
SF 2024, B 213, robbed road, 300–450.

4.38* Dark blue translucent glass inlaid with three rings of white paste. (Temp.223h, 224b are similar but in different colours).
Length 6.9mm, diameter 7.5mm.
SF 3201, E 1036, occupation surface, 450–600.

4.39* Conical black glass bead decorated with eight rows of triple swags in trailed yellow paste (Temp.349).
Length 9.7mm, diameter of base 10.4mm, diameter of tip 5.2mm.

SF 14232, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

Beads of various materials

There are a small number of beads made from semi-precious stones, coral, mother of pearl, amber and jet. Their forms are similar to glass beads, when not determined by the nature of the material. Thanks are due to Milcho Marinov Kossev and Dr G Tresise for help in the identification of the stones.

4.40* Mother of pearl flattened oval bead, pierced at an angle.
Length 8.7mm, width 6.5mm, thickness 3.9mm.
SF 3336, E 1192, pit-fill, 400–450.

4.41 Mother of pearl flattened bead, broken through central piercing.
Length 7.2mm, width 3.9mm, thickness 3.7mm.
SF 6638, C 4031, occupation surface, 450–600.

4.42* Red coral cylinder-shaped bead.
Length 5.7mm, diameter 3.3mm.
SF 8244, F 3318, abandonment build-up, 400–500.

4.43 Red coral cylinder-shaped bead, broken through central piercing.
Length 2.6mm, width 2.0mm, thickness 1.2mm.
SF 14238, P 5019, pre-tower ground surface, 400–450.

4.44* Pale green beryl prism shaped bead. Broken through central piercing. A common bead, imitated in glass. A similar beryl bead is attached to 2.49 (metalwork).
Length 6.6mm, width 5.1mm, thickness 3.4mm.
SF 3176, E 1036, occupation surface, 450–600.

4.45* Dark red cornelian diamond faceted bead (Guido, F.37.20). Slightly chipped.
Length 8.7mm, width 6.1mm, thickness 4.3mm.
SF 14634, P 5051, make-up taken from destruction level in Roman city, *c* 450.

4.46* Slightly milky rock crystal, flattened, truncated oval bead. (Tem.507).
Length 9.9mm, width 8.0mm, thickness 4.3mm.
SF 8103, F 3182, floor of Slav grubenhaus, 800–1000.

4.47* Dark blue stone pear-shaped bead, pierced centrally. The stone has a schiller and seems most to resemble Labradorite. A similar stone is attached to a gold necklace from the Beaurains hoard in the British Museum (GR 1924.5–14.13).
Length 18.0mm, width 10.0mm, thickness 7.6mm.
SF 10061, K 4432, robber-trench for north wall of the 'small basilica', 1750+.

4.48 Amber prism-shaped bead. Probably from the Baltic.
Length 7.7mm, width 8.0mm, thickness 6.5mm.
SF -, A 2278, hearth, 450–600.

4.49* Jet long bi-conical bead with six facets.
Length 9.3mm, max diameter 4.0mm.
SF 2699, B 317, pit-fill, 200–300.

BRACELETS OF GLASS, JET AND SHALE (Fig 4.2)

No complete bracelets have been found so the exact shapes are unknown. The plain glass bracelets are all common types with parallels throughout the Roman Empire.

4.50* Clear glass with lap jointing. Rounded square section. Max thickness 5.9mm, inner diameter 60.0mm.
SF 1016, A 1, topsoil, 1750+.

4.51 Opaque black glass, D-shaped section, width 7.0mm, thickness 4.5mm, inner diameter 45.0mm.
SF 50, A 1, topsoil, 1750+.

4.52* Opaque black glass, D section.
Width 7.4mm, thickness 4.1mm, inner diameter 60.0mm.
SF 14501, D, u/s.

4.53 Opaque black glass, D section.
Width 7.4mm tapers to 6.6mm, thickness 4.7mm increases to 4.9mm, inner diameter. 60.0mm.
SF 1150, D 426, destruction level, 1750+.

4.54 Opaque black glass, D section.
Width 7.1mm, thickness 4.7mm, inner diameter 50.0mm.
SF 14210, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

4.55 Opaque black glass.
Width 7.5mm, thickness 5.0mm, inner diameter 50.0mm.
SF 4055, D 423, destruction layer, 1750+.

4.56 Opaque black glass.
Width 7.6mm, thickness 5.2mm, inner diameter 5.0mm.
SF 14014, C 4006, topsoil, 1750+.

4.57 Opaque black glass.
Width 7.3mm, thickness 5.2mm, inner diameter 60.0mm.
SF 3238, E 1036, occupation surface, 450–600.

4.58 Opaque black glass.
Width 8.1mm tapering to 7.1mm, thickness 5.3mm tapering to 5.0mm, inner diameter 65.0mm.
SF 8114, F 3250, floor make-up for the post-medieval grubenhaus, 1750+.

4.59 Opaque black glass.
Width 8.2mm, thickness 5.3mm, inner diameter 60.0mm.
SF 8366, F 3367, cobbled roadway, 350–450.

4.60 Opaque black glass, D section.
Width 7.9mm, thickness 5.2mm, inner diameter 60.0mm.
SF -, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

4.61 Opaque black glass, D section.
Width 7.2mm, thickness 4.6mm, inner diameter 60.0mm.

SF 8351, F 3240, mortar spread in nave, 450–600.

4.62* Opaque black glass, D Section.
Width 3.6mm, thickness 2.8mm, inner diameter 60.0mm.
SF 14201, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

4.63* Opaque black glass, regularly nipped to form four gadroons. D section.
Width 8.3mm, thickness 5.2mm, inner diameter 60.0mm. A similar bracelet comes from Iatrus (*Iatrus* I, Taf. 65.213).
SF 6466, C 4006, topsoil, 1750+.

4.64* Jet, D section, undecorated.
Width 12.5mm, thickness 7.4mm, inner diameter 60.0mm.
SF 1027, D 402, destruction level, 1750 +.

4.65* Jet. The bracelet is split latitudinally, originally having a deep D section. The remaining surface is decorated with an incised line and on the outer edge by a V-shaped notch and two shallow wedge shaped notches. This toothed decoration can be seen in bracelet fragments from Colchester (Crummy 1983, 37, fig 38).
Width 5.5mm, thickness 9.8mm, inner Diameter 60.0mm.
SF 12086, M 4834, building collapse, 1750+.

4.66 Shale, D section.
Width 8.0mm, thickness 4.8mm, inner diameter 60.0mm.
SF 7815, F 3141, robber-trench fill, 1750+.

4.67 Shale, D section.
Width 7.6mm, thickness 5.3mm, inner diameter 60.0mm.
SF 14729, P 5052, make-up deposit, 100–300.

JET RINGS AND PIN (Fig 4.2)

Three small objects of jet were found.

4.68* Jet ring, broken through shank and bezel. The outer profile is hexagonal. The bezel is decorated with a lozenge shaped groove, and its edges bevelled with shallow triangles.
Width 7.0mm, thickness 2.8mm, inner diameter 15.0mm.
SF 14015, D 628, silty build-up, 450–600.

4.69* Jet ring, broken through shank and bezel, D section. The bezel is a raised circle with a plain surface.
Width 9.4mm, thickness 3.3mm, inner diameter 15.0mm.
SF 14603, E, u/s.

4.70* Jet pin shaft, tapering, decorated with two parallel grooves.
Length 18.8mm, Max diameter 5.3mm.
SF 14456, C 125, soil accumulation over roadway, 450–600.

GLASS GAMING PIECES (Fig 4.2)

4.71* Dark brown glass plano-convex counter, with a central dot and two concentric circles of yellow rings. Similar to the set found at Lullingstone (Liversidge 1973) but larger.
Diameter 24.7mm, thickness 7.0mm.
SF 12149, M 4868, topsoil, 1750+.

4.72* Turquoise glass plano-convex counter.
Diameter 18.0mm, thickness 5.7mm.
SF14312, P 5024, dump of destruction debris, 250–300.

4.73* White translucent glass counter with chipped edges. Possibly made from a vessel.
Diameter 12.0mm, thickness 0.6mm.
SF 1116, D 415, floor of building, 1750+.

4.74 White translucent glass counter, similar to 4.73.
Diameter 11.4mm, thickness 0.6mm.
SF 14322, P 5025, dump deposit, 250–300.

MISCELLANEOUS GLASS OBJECTS (Fig 4.2)

4.75* Glass drop of green glass. Possible a pestle, or a drop from a chandelier.
Length 49.6mm, max diameter 13.5mm.
SF 14669, P 5051, make-up taken from destruction level in Roman city, *c* 450.

4.76* Glass inlay. a) Two parallel strips of white and yellow glass; b) white glass with yellow rosettes. Uncertain whether these are from inlaid decoration or raw material for bead manufacture.
Length 18.0mm, width 4.2mm, thickness 1.8mm.
Length 22.6mm, width 5.5mm, thickness 3.5mm.
SF 8202, F 3292, clay make-up for a floor, 400–450.

4.77* Mount of clear glass, rectangular and with bevelled edges. May have been mounted as 2.114 (metalwork).
Length 13.3mm, width 10.7mm, thickness 2.6mm.
SF 6453, C, u/s.

4.78* Mount. Clear glass hexagonal mount, truncated cone, either base or summit could have been the exposed surface.
Length 4.8mm, width 8.0mm, thickness 5.8mm.
SF 7459, F 3119, the collapsed mud walls of a grubenhaus (3063), 1750+.

4.79* Mount? Pale green glass plano-convex oval. A mount or small gaming piece.
Length 15.6mm, width 11.3mm, thickness 6.2mm.
SF 8154, F, u/s.

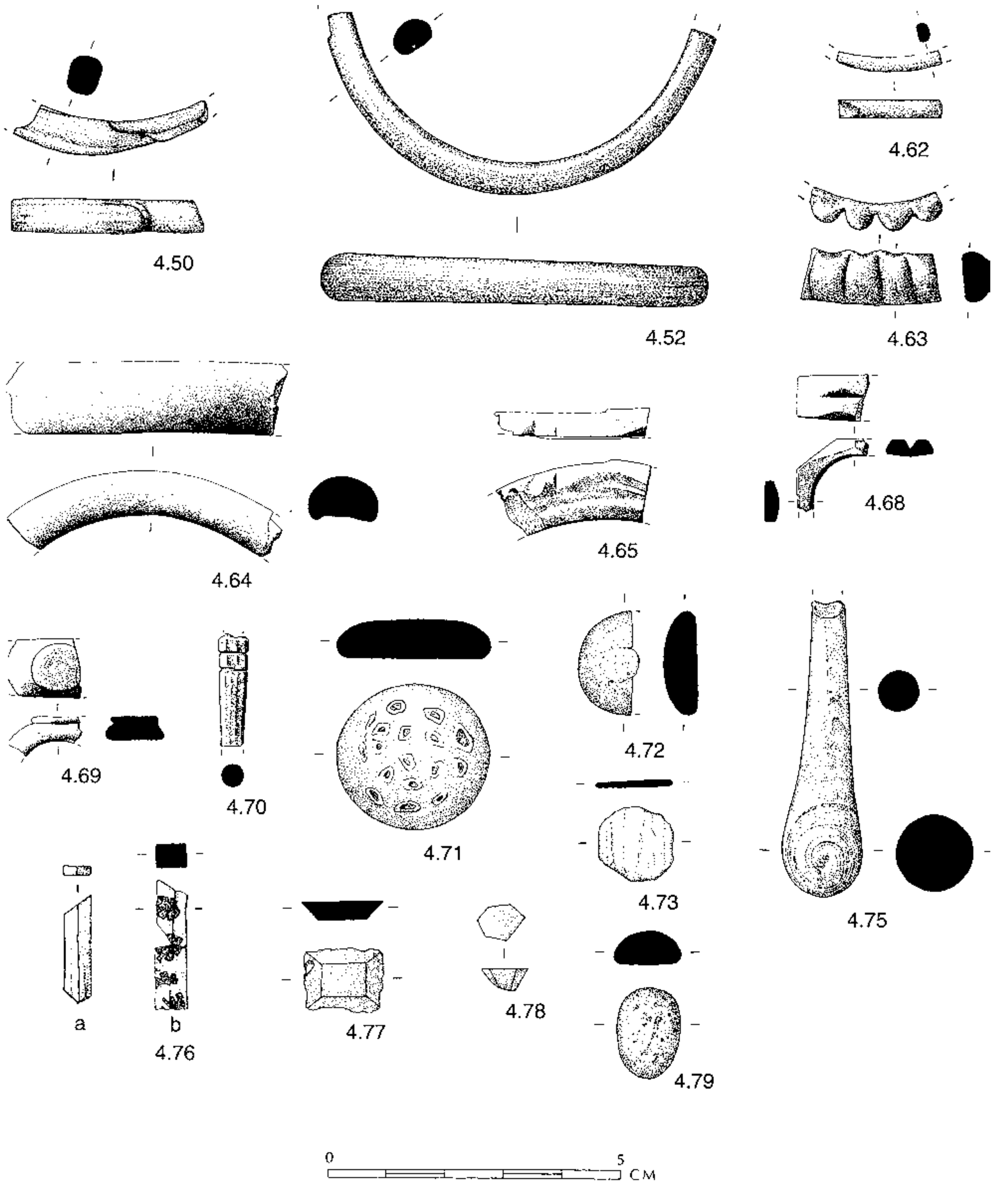


Fig 4.2 Bracelets, Jet, Glass Gaming Pieces and Miscellaneous Glass Finds

5

INTAGLIOS

by

Martin Henig

15.1 Plasma intaglio (Fig 5.1 and Fig 5.2a)
The stone is oval with convex upper face; the lower face is also convex (as shape B1), but the gem is table-cut horizontally towards its base. It bears the device of a dolphin swimming towards the left (actual gem described), with tail upwards. It is plump and well-modelled, the result of bold and accomplished cutting, and although the device does not call for elaborate detailing, the flukes of the tail are ornamented with very fine grooves. The intaglio is finished with a high polish. This work is typical of the Classicising style normally ascribed to the Julio-Claudian period.
Comparanda: Walters 1926, no. 2500 cut on an aquamarine and Zazoff 1975, no. 1305, a cornelian, bear almost identical dolphins as does Zwierlein-Diehl 1991, no. 1912, a nicolo showing a dolphin, stylistically similar but set (or re-set) in a third-century ring. Also see Maaskant-Kleibrink 1978, no.510, a plasma which portrays Eros riding just such a dolphin, and likewise ascribed to the Classicising style.
Dimensions: 12.5 by 10 by 4.5 mm.
SF 14044, A 2180, pit-fill, undated.



Fig 5.1 Plasma Intaglio

5.2. Red Jasper intaglio set in the remains of a bronze ring (Fig 5.3 and Fig 5.2b, also see 2.34, metal-work).
The intaglio is oval with a flat upper face (shape presumably F1). The ring is narrow, with a hoop of D-shaped section, widening markedly at the bezel (type III). Its setting is a youthful mask of Pan, shown to the left (actual gem); the subject is identified by virtue of two swept-back horns sprouting from the forehead. The gem is carefully cut with lap-wheels of different thickness, giving a delicately patterned texture to the hair. The cutting is similar to that of gems which Maaskant-Kleibrink attributes to her Small Grooves style (1978, nos. 745, 746) but which I have designated as Patterned style (Henig 1988,151) and dated to the second century, when red jasper became popular. The ring form was still current at this time.
Youthful heads of Pan are not common but note the mask (confronting a maenad) on a jasper in the British Museum (Walters 1926, no. 1626). Some-what similar in theme is the satyr mask on a red jasper found at the Aitos Baths (Dimitrova-Milcheva 1981, no. 115) but the cutting is here

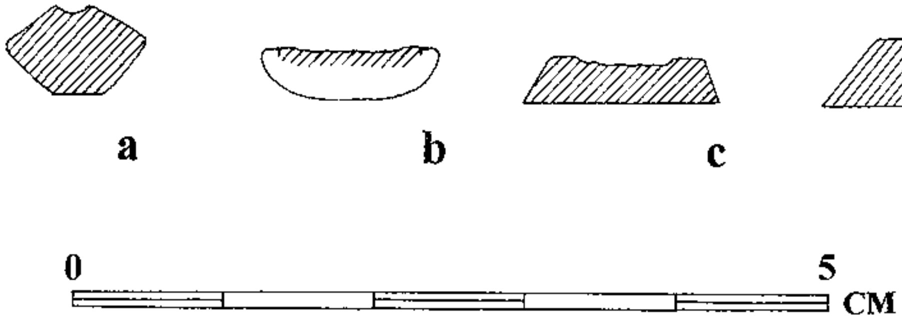


Fig 5.2 Intaglio Profiles



Fig 5.3 Red Jasper Intaglio

more fluid and the gem dates to the first century. The half-length satyr-mask on a jasper from Gadara is closer in style (Henig and Whiting 1987, no. 253). Bearded Pan-masks are more often found, with red jasper as the most popular recipient for the image, see Brandt 1972, nos. 2589, 2590, Gramatopol 1974, no. 114 (Pan not Ammon as stated), Zazoff 1975, no. 1102, Henig 1978, no. 144, Zwierlein-Diehl 1991, no. 2089.
Dimensions: Ring (hoop incomplete), diameter 20 mm, width at narrowest point 2 mm, width across bezel 11.5 mm. Intaglio: 11.5 by 9.5 mm.
SF 12080, M 4835, pit-fill, 450–600.

5.3. Cornelian intaglio, highly translucent, colour lemon-yellow and orange (Fig 5.4 and Fig 5.2c)
It has flat upper and lower surfaces and sides which bevel outwards (shape F2). The gem has lost its upper third and is chipped on the right side. It shows a female figure seated on a cuirass in profile to the right (actual gem). Her left arm is outstretched and she holds a patera in her hand. Behind her is a shield and a spear (which she was probably represented as holding in her right hand). There is a ground line. The head of the figure is lost, but she can be identified as Athena. The neat linear form embellished with hatched patterning on a light-coloured stone is suggestive of Flavian glyptics; the gem might be assigned to Maaskant-



Fig 5.4 Cornelian Intaglio

Kleibrink's Classicising Stripy Style (1978, 247), or in my simplified schema (1988, 147–151) to an early stage in the Flavian group.
For the subject compare the seated figures of Minerva, holding either her spear or a victory in front of her, Sena Chiesa 1966, nos. 155–160 (especially the cornelians, nos. 155 and 159 with similar patterning); Hamburger 1968, no. 40 (cornelian), Gramatopol 1974, no. 118 (cornelian). C. C. Vermeule (1974, 71–73) points out that the type was adapted for the cult-image of Dea Roma in Hadrianic times, but I do not think she was intended here.
Dimensions: surviving length 13 mm, surviving width 11.5 mm, thickness 2.5 mm.
SF 14449, M 4871, pit-fill, 350–450.

5.4. Sardonyx ringstone (Fig 5.2d)
The gem is ovoid and cut in the shape of a truncated cone (Form F3).
There is no intaglio device, and no reliable means of dating the stone, but such small truncated cones seem to have been popular in the third century, cf, Marshall 1907, nos. 525, 525*, 532, and 533.
Top surface 6 by 4 mm, base 12 by 9 mm. Thickness 5 mm.
SF 12212, M 4888, topsoil, 1750+.

Although all four gems are clearly earlier than the contexts in which they were found, they comprise an interesting addition to the corpus of gems, many of them site finds, in the National Archaeological Museum, Sofia (Dimitrova-Milcheva 1981). However as the three cut examples here are of different styles and dates and do not closely match any of the published intaglios in the Sofia catalogue, it is not possible to assign them to local studios.

6

CERAMIC OBJECTS

by

Rob Falkner

For descriptions of the wares, cited in the following report, see the summary below (p. 103 and Falkner in Poulter (1999), appendix 1, 274–280.

FIGURINES (Figs 6.1 and 6.2)

Twenty-nine fragments of human figurines were found during the excavations, of which twenty were sufficiently well preserved to merit illustration. The remaining fragments are described but are not illustrated. All finds, with the exception of 6.15, are in local fabrics, most in ware 8, only 6.9, 6.16 and 6.29 are in ware 4. The majority of these figurines are residual and came from post-medieval contexts. Consequently, it is not possible to determine to which period they belong although Soultov (1976 and 1985) illustrates several similar figurines which he ascribes to the 3rd and 4th centuries AD. Perhaps significant, however, is the fact that the only piece in a non-local fabric came from the earliest period in the history of the city, a context dated 100–130 (6.15).

6.1* Moulded piece of a human figure showing complete head wearing a Phrygian hat. Red slip.
SF 8220, F 3250, floor make-up for the post-medieval grubenhaus, 1750+.

6.2* Moulded piece from the head of a human figure extant from the eyes down, and including the top of the neck. Orange slip.
SF 14561, K 4480, fill of grubenhaus, 1750+.

6.3* Moulded piece from the lower part of a human face showing pointed jaw and lips (cf, Soultov 1976, 93). Orange slip.
SF 1200, D 404, destruction level, 1750+.

6.4* Moulded piece from a human head missing the top right hand quadrant. Red slip.
SF 3352, E, u/s.

6.5* Moulded piece from a human figure showing head and neck, missing the back left portion of the head. The face is lopsided, with the right side pushed in. A bushy beard is clearly visible. Light brown slip.
SF 10211, K 4505, soil accumulation over floor of building, 400–500.

6.6* Moulded piece from a human figure showing crude stylised head and neck. The eye sockets are extremely deep. Dusky red slip.
SF 8090, F 3194, pit-fill. 1750+.

6.7* Moulded piece from a human figure showing the face and neck. The face is bearded, and the hair is clearly shown. From the markings on the reverse of this piece it would seem that the top part is complete - there never was a back to the head. Worn brown slip.
SF 3325, E 1190, pit-fill, 400–450.

6.8* Moulded piece from the head of a human figure showing bearded face. The face is slightly lop-sided, the nose is slightly squashed, and the detail on the right hand side of the face has been lost. As in the previous example, there was originally no back to the head: it is possible that both of these pieces were decorative elements from pottery vessels (cf, Soultov 1976, 52–3), the distortion caused by pressing the face on to a pottery vessel whilst still too wet. Red slip. The piece is burnt.
SF 14502, D, u/s.

6.9* Moulded piece from the body of a human figure showing central part of the torso, stub of right arm and left hand. Lower part of pendant visible (cf, Soultov 1976, 86). Traces of white slip.
SF 14561, K 4480, fill of grubenhaus, 1750+.

6.10* Moulded piece from a human figure showing the left part of the chest with arm folded against it; part of a necklace is visible, and some type of decoration on the body below the folded arm (cf, Soultov 1976, 92, top right). Dusky red slip.
SF 12051, M, u/s.

6.11* Moulded piece from the left side of a human figure, showing the shoulder, chest and base of the neck. There is a design consisting of circles on the body. Orange slip.
SF 14849, D 635, levelling deposit, 250–350.

6.12* Moulded piece from the body of a human figure showing left part of chest. The pattern on the cloak is deeply cut, and part of a decorated

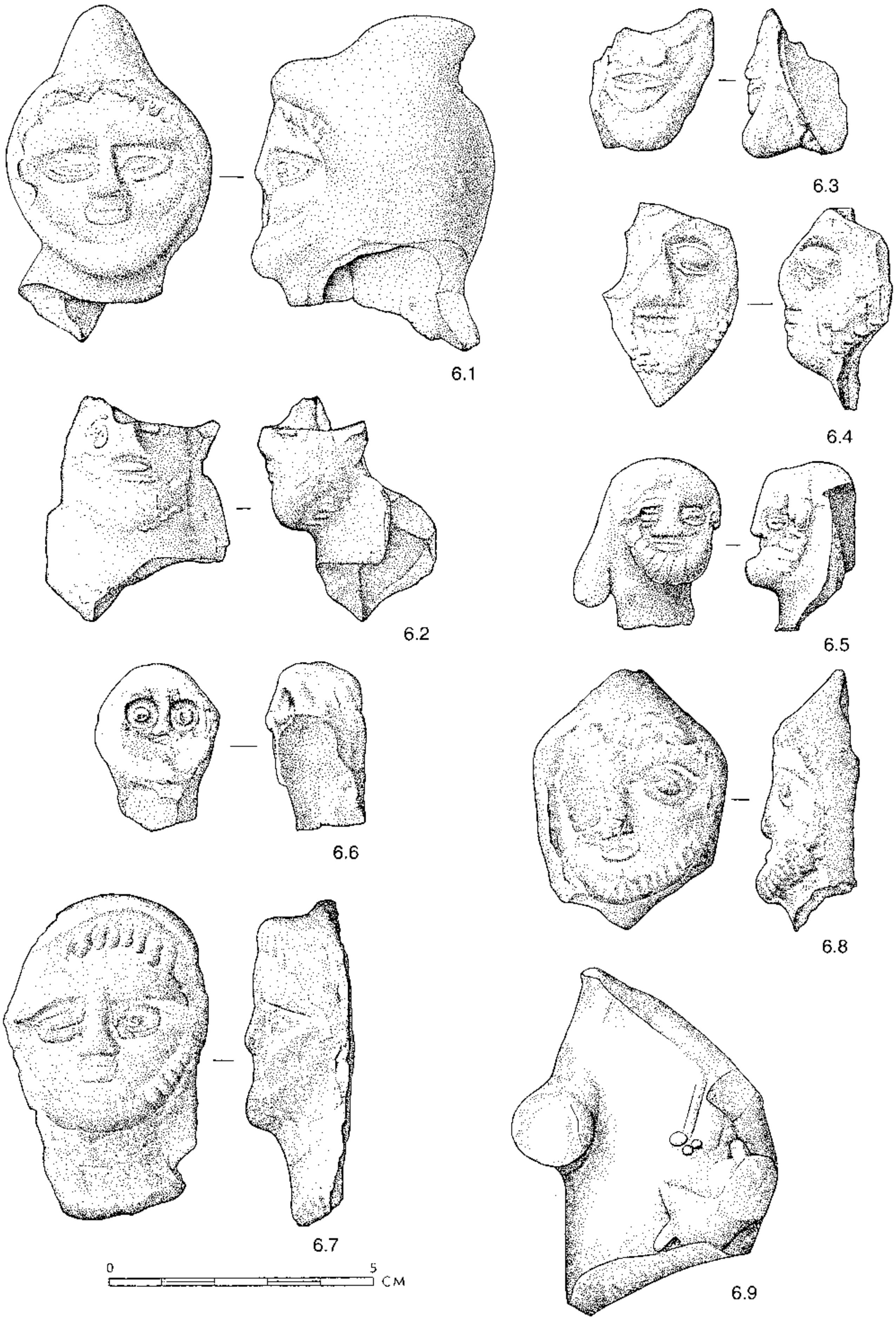


Fig 6.1 Figurines

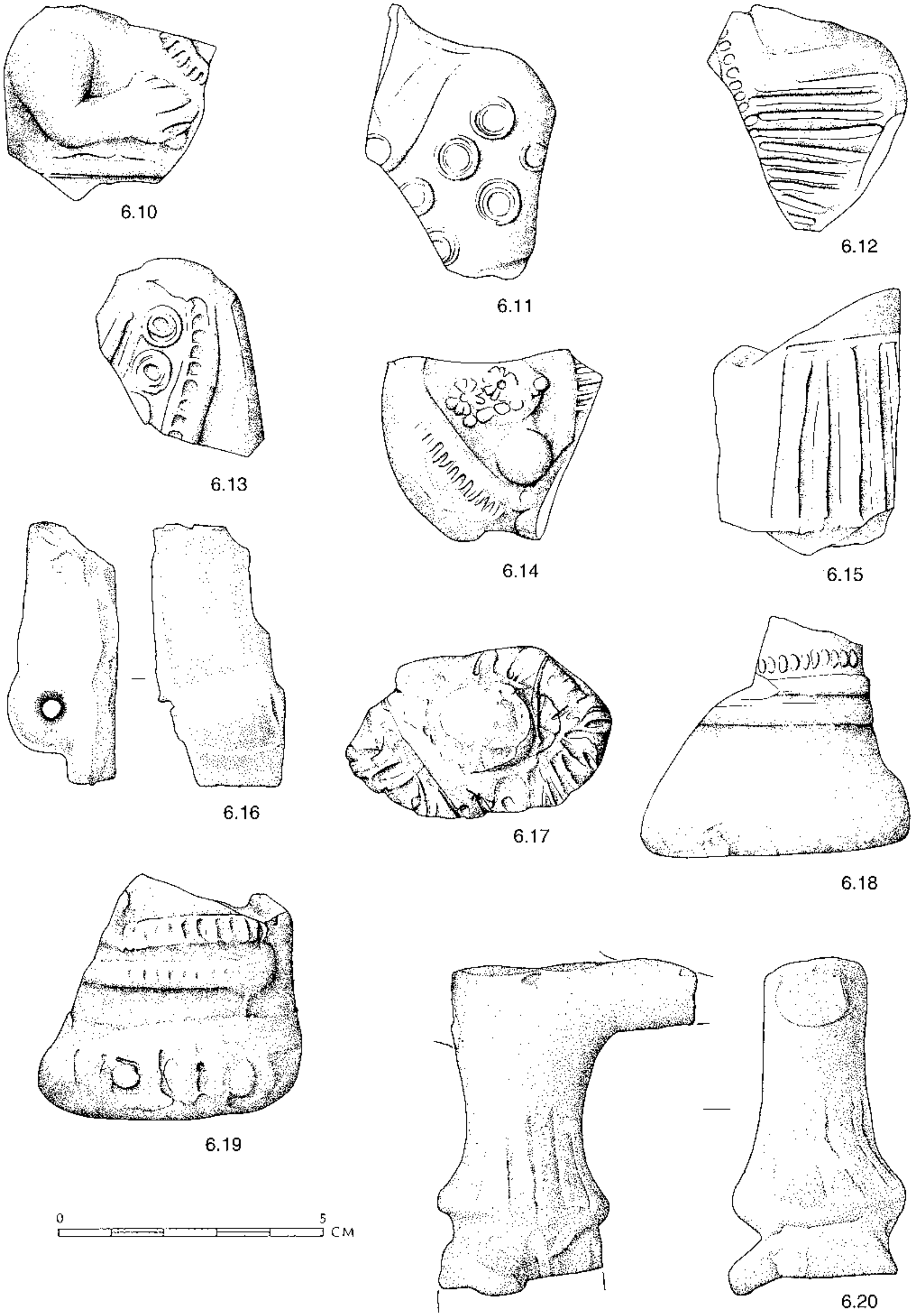


Fig 6.2 Figurines

cross-belt is visible. Brown slip.
SF 14827. K 4463, post-medieval robbing debris, 1750+.

6.13* Moulded piece from the left side and shoulder of a human figure showing some type of ornamental chain. Red slip.
SF 14855, D, u/s.

6.14* Moulded piece of part of the chest and arm from a human figure showing necklace and pendant. Dark grey slip.
SF 14602, K 4453, make-up for nave floor, 450–600.

6.15* Moulded piece from the lower part of a human figure showing the folds in the dress. The fabric is light brown, gritty and micaceous.
SF 14872, A 2272, fill of primary rubbish pit, 100–130.

6.16* Moulded piece from a human figure showing the lower part of the right arm from below the elbow. The fist is clenched, and has had a hole pushed through the centre after being removed from the mould, but before firing – presumably so that the figure could hold something. Traces of white slip.
SF 14832, A 2277, primary pit fill, 100–130.

6.17* Top view of moulded piece from the shoulders of a human figure with the severed neck visible in the centre. The deep incisions in the modelling of the cloak were added after the piece was removed from the mould, but before firing. Red slip.
SF 14867, K 4512, make-up deposit, 300–450.

6.18* Moulded base of a statuette with bands of decoration above. Dusky red slip.
SF 14831. K 4505, soil accumulation over floor of building, 400–500.

6.19* Moulded piece from the base of a human figure, showing two notched bands above the base. Worn red slip.
SF 14863, F 3250, floor make-up for the post-medieval grubenhaus, 1750+.

6.20* Piece from a human figure showing complete body, missing left foot, head, right arm and left lower arm. The piece is sculpted and not mould-made, the folds in the cloak being incised. Red slip.
SF 12273, M 4907, backfill of grubenhaus, 1750+.

6.21 Moulded piece from the back of a human head, diameter *c* 30mm, no decoration. Dusky red slip.
SF 1231, D 414, cobbled surface, 1750+.

6.22 Moulded piece from the base of a human figure, diameter *c* 45mm, Orange slip.
SF 14860, K 4508, floor level within the 'early building,' 250–450.

6.23 Moulded piece from the base of a human figure, diameter *c* 50mm, Dusky red slip.
SF 14553, D 662, make-up deposit, 250–350.

6.24 Moulded piece from the chest of a human figure. Estimated measurement from shoulder to shoulder 55mm, Reddish brown slip.
SF 3087, E 1024, occupation level, 450–600.

6.25 Moulded piece probably from the shoulder of a human figure. Light brown slip.
SF 1069, C 12, topsoil, 1750+.

6.26 Moulded piece probably from the chest and shoulder of a human figure. Light brown slip. SF 14842, F 3139, demolition level, 1750+.

6.27 Moulded piece from left side of chest. Orange slip.
SF 14561, K 4480, fill of grubenhaus, 1750+.

6.28 Moulded piece from a human figure showing part of left shoulder and upper arm. Ware 8. Orange slip.
SF 14561, K 4480, fill of grubenhaus, 1750+.

6.29 Moulded piece that may represent a soldier's head with a horses plume helmet with diamond pattern on it. However, unlike all the other human heads, there are no facial details and it is possible that the piece may be part of an animal.
SF 14873, D 681, occupation surface, 200–300.

PLAQUE (Fig 6.3)

Only one plaque fragment was found (in a local fabric: ware 4).

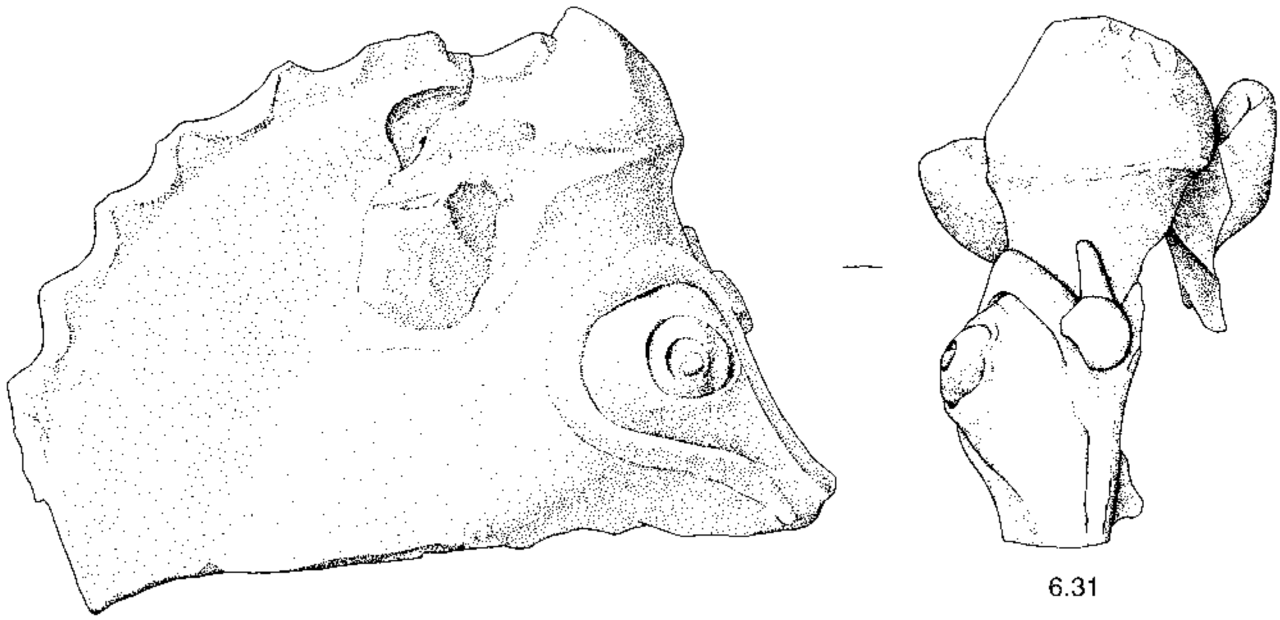
6.30* Moulded piece of the lower half of a male human from just below the knee to the hips; a club is resting against the figure's right leg. Probably Hercules.
SF 14833, D 682, pit-fill, 400–500.

TOYS? (Figs 6.3 and 6.4)

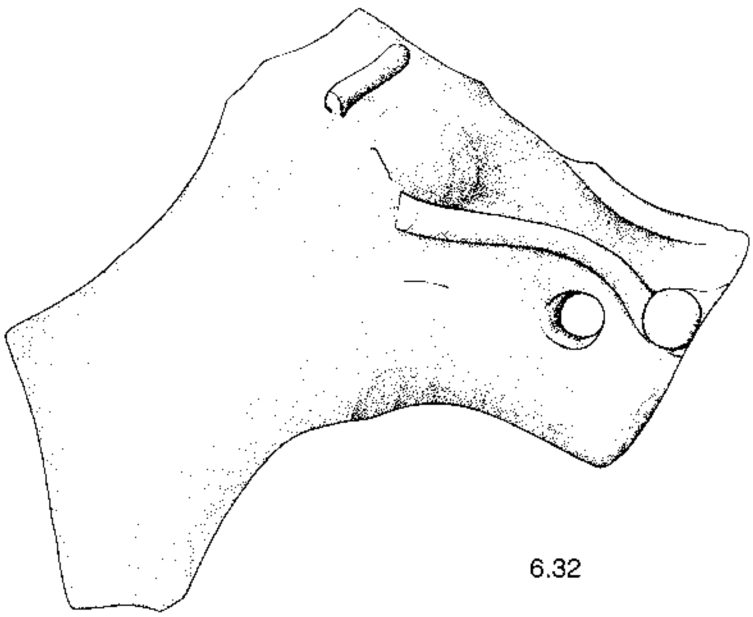
Sixty-five fragments of horse figurines were found during the excavations, 41 of which were fragments of wheels. They are all in a local red-slipped fabric (ware 8). For a complete example see Soultov (1976, 95), dated to the 3rd/4th centuries AD. Of the finds from Nicopolis, one came from a context dated 150–250, and one from a context dated 175–250. The rest all came from later contexts. It is likely, therefore, that these toys were first introduced around the middle of the 3rd century. Illustrated are 3 horses' heads and 9 examples of different types of wheel. The function of these images is unknown. They may have been children's toys or perhaps representations of a deity, possibly the Thracian Rider god.

6.31* Part of the moulded head of a horse (cf, Soultov 1976, 94 and 95), showing the mane, ears, right eye and part of the bridle. The ears and the bridle were applied after removal of the head from the mould. Orange slip.
SF 11039. C 5306, burnt dump, backfilling of the defensive ditch 3, 250–350.

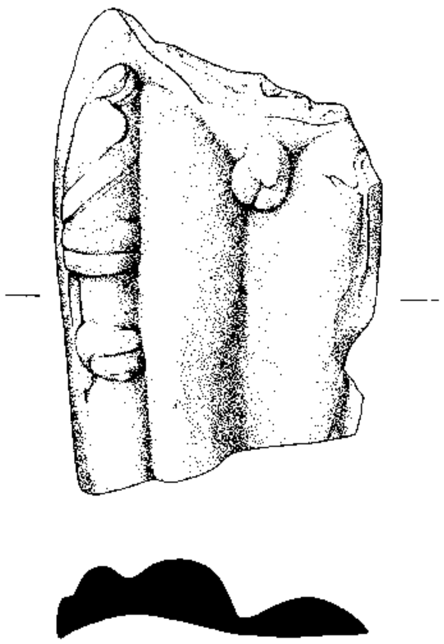
6.32* Part of the moulded head of a horse showing



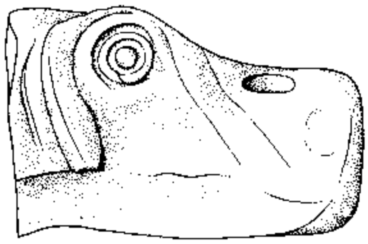
6.31



6.32



6.30



6.33

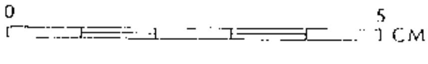


Fig 6.3 Ceramic Plaque and Toys

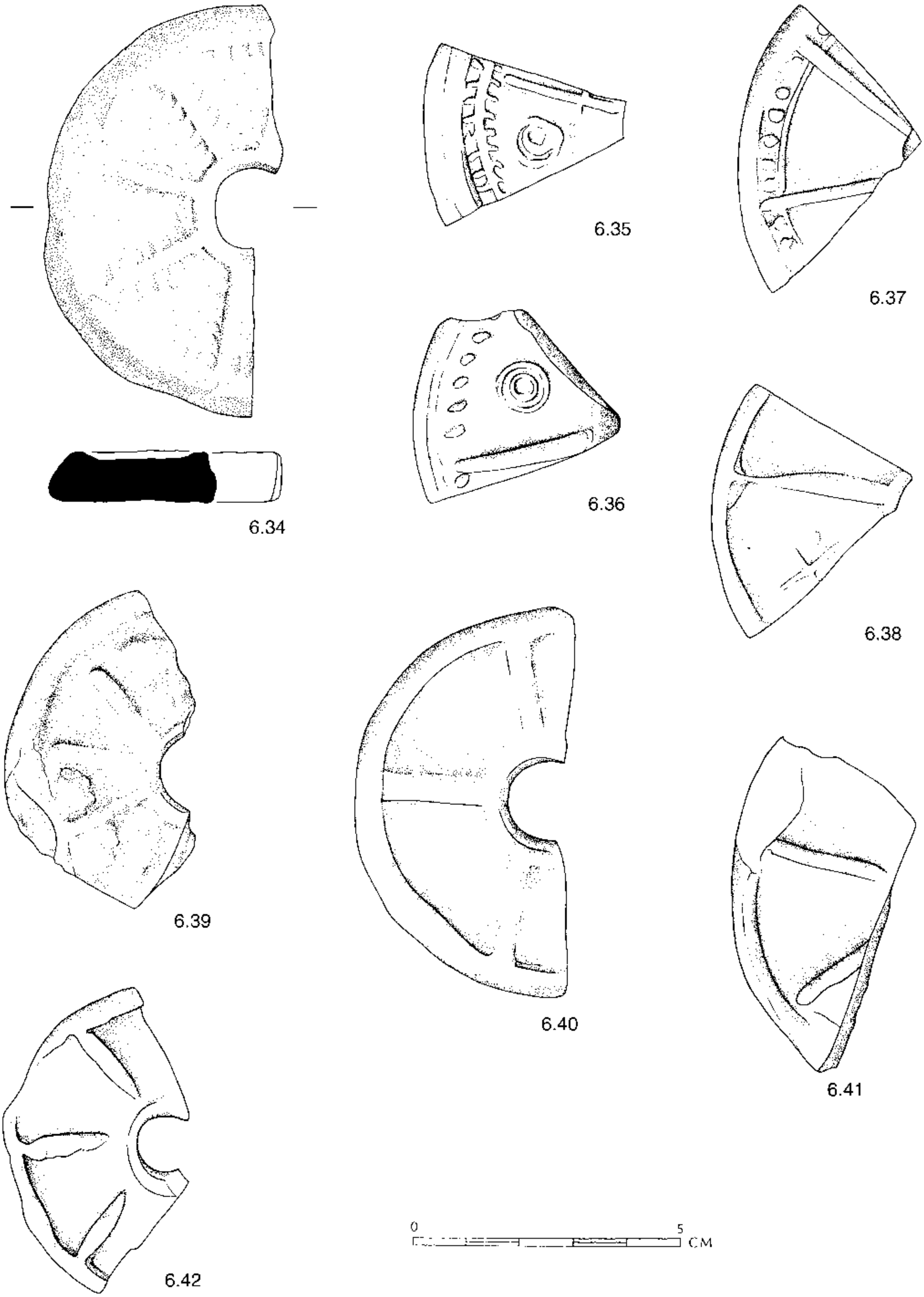


Fig 6.4 Ceramic Toys

right eye, right nostril and a part of the bridle. Dusky red slip.
SF 14786, K 4512, make-up deposit, 300–450.

6.33* Part of the moulded head of a horse showing the right eye, the right nostril and a part of the bridle. Red slip. The piece shows patches of burning.
SF 14315, P 5028, destruction level, 250–300.

6.34* The inside of a rim of a moulded wheel, five spokes (out of a total of eight), and the central axle hole. The inside the rim and the spokes are decorated with a herring-bone design. Worn red slip.
SF 4263, D 491, destruction deposit over occupation surface, 450–600.

6.35* Part of a moulded wheel showing the rim with a herring bone pattern on the inside, one spoke, part of the central axle hole and a circle decorating the space between the spokes. Dusky red slip.
SF 2510, D 542, occupation level, 450–600.

6.36* Part of a moulded wheel with a beaded pattern below the rim. One spoke, part of the central axle hole and a design of two concentric circles in the space between the spokes. Dark brown slip.
SF 14780, K 4479, robbing debris, 1750+.

6.37* Part of a moulded wheel showing the rim with beaded decoration and two spokes (out of a total of six). Red slip.
SF 14582, K 4405, topsoil, 1750+.

6.38* Part of a moulded wheel showing rim, one spoke (out of a total of four or five), and part of the central axle hole. A cross is visible in the space between the spokes. Red slip.
SF 4518, D 559, destruction deposit, 375–450.

6.39* Part of a moulded wheel showing rim, five spokes (out of a total of ten), with indeterminate decoration between them, and central axle hole. Ware 8. Dusky red slip.
SF 4334, D 554, occupation surface, 450–600.

6.40* Part of a moulded wheel (cf, Soultov 1976, 95), showing rim, three spokes (out of a total of five), and central hole for a wooden axle. Worn orange slip.
SF 14788, K 4480, fill of grubenhaus, 1750+.

6.41* Part of a moulded wheel showing rim and two spokes (out of a total of eight). Red slip.
SF 14053. D 601, pit fill, 350–450.

6.42* Part of a wheel showing the rim, three spokes (out of a total of six), and the central axle hole. Though the main part of the wheel was probably mould-made, the rim has been pushed over after the wheel had been removed from the mould and the spokes were then added.
SF 4414, D 583, pit-fill, 450–500.

REUSED CERAMICS (Figs 6.5 and 6.6)

All the reused ceramics that were identified are included in this catalogue.

RECTANGULAR AND SQUARE PIECES

The sawn pieces are nearly all sawn almost in half and then snapped off.

6.43* Rectangular piece from a tile; three sides are sawn; the other is the original side of the tile. The fabric is probably Roman.
Dimensions 35 × 23 × 20mm, weight 23.5g.
SF 12036, M 4824 silt build up, 1750+.

6.44* Roughly square sawn piece from a ware 8 bowl. Brown slip on one side. The fabric is Roman.
Dimensions 22 × 20 × 6mm, weight 4.0g.
SF 14062, A 2159, backfill of ditch, 450–500.

6.45* Roughly square sawn piece from a ware 4 vessel. The fabric is Roman.
Dimensions 13 × 12 × 6mm, weight 1.5g.
SF 14062, A 2159, backfill of ditch, 450–500.

6.46* Rectangular sawn piece from a ware 4 vessel. The fabric is Roman.
Dimensions 22 × 14 × 10mm, weight 5.0g.
SF 14627. P 5051, make-up taken from destruction level in Roman city, *c* 450.

6.47 Roughly square sawn piece from a ware 8 jar. Red slip on one side. The fabric is Roman.
Dimensions 16 × 17 × 7mm, weight 4.0g.
SF 13523, S 5251, robber-trench, 1750+.

6.48 Roughly square sawn piece from a ware 4 vessel that has been partly vitrified after reuse, The fabric is Roman.
Dimensions 20 × 17 × 7mm, weight 3.5g.
SF 14284, P 5021, dump of destruction debris, 250–300.

6.49 Roughly square piece from a tile. The fabric is probably Roman.
Dimensions 29 × 28 × 19mm, weight 22.5g.
SF 14547, A 2186, backfill of ditch, 450–500.

6.50 Rectangular sawn piece from a tile, the fabric is probably Roman.
Dimensions 43 × 30 × 20mm, weight 40.0g.
SF 12040, M 4825, pit-fill, 450–600.

ROUNDELS

Although most pieces are slightly irregular, a diameter is provided: the greatest distance across the piece. For those with a central hole, the diameter is given at the narrowest point of the hole. For broken pieces diameters are estimated. Thickness measurements are across the thickest part of the piece. Weights are given in grams to the nearest 0.5g. Where the piece is broken, the actual weight of the piece is given together with an estimated weight (in brackets), for the complete object. Some may well have been used as loom-weights, others as spindle-whorls.

Ground or partly ground edges without a central hole

6.51* Near circular piece from a tile, the fabric is probably Roman.
Diameter 54mm, thickness 22mm, weight 84.5g.
SF 11, A 1, topsoil, 1750+.

6.52* Near circular piece from a ware 8 jar. Reddish slip on one side. The fabric is Roman.
Diameter 50mm,Thickness 9mm, weight 32.5g.
SF 14549, D 686, cobbled surface, 200–300.

6.53* Near circular piece from a shattered tile - neither the top nor the bottom are the original tile surfaces. The fabric is probably Roman.
Diameter 19mm, thickness 5mm, weight 2g.
SF 6431, C 4006, topsoil, 1750+.

6.54* Irregular piece from a tile.
Diameter 20mm, thickness 20mm, weight 10.0g. The fabric is probably Roman.
SF 14178, P 5018, make-up for the primary floor of the tower, *c* 450.

6.55 Near circular piece, with a slight point to one side, from a ware 41 vessel.
Diameter 57mm, thickness 10mm, weight 30.5g. The fabric is Roman.
SF 14915, D 658, destruction deposit, 375–450.

6.56 Near circular piece from a ware 8 bowl. Red slip on one side. The fabric is Roman.
Diameter 36mm, thickness 7mm, weight 10g.
SF 1234, B 231, pit-fill, 150.

Ground or partly ground edges with central hole

6.57* Near circular piece from a tile. The fabric is probably Roman.
Diameter 55mm, thickness 21mm, diameter of the hole 6mm, weight 64.5g.
SF 12187, M 4880, demolished mudbrick wall, 200–275.

6.58* Near circular piece (broken), from an unidentified amphora. Buff slip on one side. The fabric is presumably Roman.
Diameter 70mm, thickness 12mm, diameter of hole 10mm, weight 42.5g (81.0g).
SF 4315, D 536, silty build-up, 400–450.

6.59* Circular piece from the base of a ware 8 vessel, probably a jar. The fabric is Roman.
Diameter 39mm, Thickness 13mm, diameter of the hole 7mm, weight 27.5g.
SF 4218, D, u/s.

6.60 Near circular piece (broken), from a tile. The fabric is probably Roman.
Diameter 65mm, thickness 20mm, diameter of hole 17mm, weight 48.5g (102.0g).
SF 14903, M 4846, robber-trench fill, 275–450.

6.61 Near circular piece (broken) from a tile. The fabric is probably Roman.
Diameter 62mm, thickness 24mm, diameter of hole 11mm, weight 65.5g (117.5g).
SF 10223, K, u/s.

6.62 Irregular piece (broken), from a tile, The fabric is probably Roman.
Diameter *c* 120mm, thickness 24mm, diameter of hole *c* 25mm, weight 126.0g (378.0g).
SF 14599, K 4431, robber-trench fill, 1750+.

6.63 Circular piece (broken), from the base of a ware 8 vessel, probably a jar, The fabric is Roman.
Diameter 35mm, thickness 8mm, diameter of the hole *c* 6mm, weight 4.0g (11.5g).
SF 4246, D 491, destruction deposit over occupation surface, 450–600.

Chipped edges with no central hole

6.64* Near circular piece from an African ware 37 amphora. Buff slip on one side, The fabric is Roman.
Diameter 51mm, thickness 10mm, weight 31.0g.
SF 14459, C 4116, pit-fill, 100–175.

6.65* Near circular piece from a ware 23 amphora. The fabric is Roman.
Diameter 36mm, thickness 8mm, weight 13.0g.
SF 4283,D 445, primary collapse over floor in west room of the 'workshops', 450–600.

6.66* Near circular piece from a tile. The fabric is probably Roman.
Diameter 60mm, thickness 20mm, weight 94.5g.
SF 14458, K, u/s.

6.67* Near circular piece from a tile. The fabric is probably Roman.
Diameter 45mm, thickness 20mm, weight 50.5g.
SF 6903, A 7, robber spoil, 1750+.

6.68* Near circular piece from a tile, the fabric is probably Roman.
Diameter 108mm, thickness 24mm, weight 327.5g (344.0g).
SF 14133, P 5018, make-up for the primary floor of the tower, *c* 450.

6.69 Near circular piece from a ware 1 jar. The fabric is Roman,
Diameter 34mm, thickness 7mm, weight 4.5g.
SF 14296, P 5022, dump of destruction debris, 250–300.

6.70 Irregular piece from a ware 8 jar. Thin brown slip on one side. The fabric is Roman.
Diameter 25mm, thickness 6mm, weight 4.5g.
SF 14066, A 2143, backfill of ditch, 450–500.

6.71 Near circular piece from a ware 4 jar. The fabric is Roman.
Diameter 42mm, thickness 7mm, weight 12.5g.
SF 14551, D 662, make-up deposit, 250–350.

6.72 Near circular piece (broken), from a ware 8 jar. Orange slip on one side. The fabric is Roman.
Diameter 38mm, thickness 7mm, weight 8.0g (15.0g).
SF 14265, P 5020, cultivation soil, 250–350.

6.73 Irregular piece (broken), from a ware 96 amphora. The fabric is Roman.
Diameter 40mm, thickness 11mm, weight 18.0g (29.0g).
SF 14910, E 1110, make-up deposit, 450–600.

6.74 Near circular piece (broken), from a ware 8 jar. Red slip partly covering one side. The fabric is Roman.
Diameter 50mm, thickness 7mm, weight 14.5g (24.0g).
SF 14465, K 4506, floor of building, 300–450.

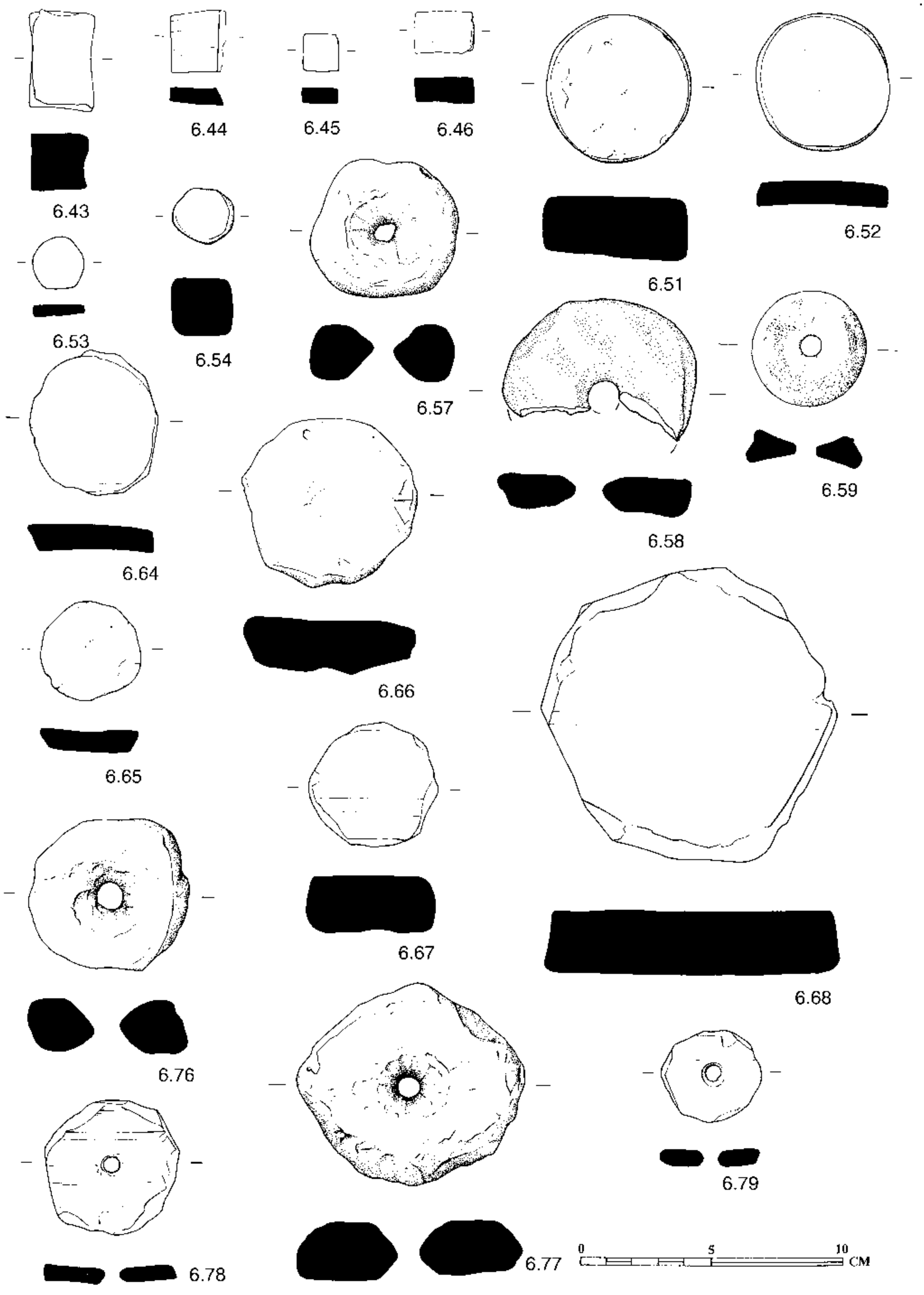


Fig 6.5 Reused Ceramics

6.75 Near circular piece from a tile. The fabric is probably Roman.
Diameter 70mm, thickness 19mm, weight 107g.
No SF number, u/s.

Chipped edges with central hole

6.76* Near circular piece from a tile. The fabric is probably Roman.
Diameter 60mm, thickness 20mm, diameter of the hole 9mm, weight 73.0g.
SF 10189, K 4406, fill of grubenhaus, 1750+.

6.77* Near circular piece from a tile. The fabric is probably Roman.
Diameter 82mm, thickness 21mm, diameter of hole 6mm, weight 120.5g.
SF 4286, D 402, destruction level, 1750+.

6.78* Near circular piece from a ware 8 jar. Traces of thin red slip on one side. The fabric is Roman.
Diameter 51mm, thickness 6mm, diameter of hole 6mm, weight 17.5g.
SF 14444, M 4824, silt build up, 1750+.

6.79* Nearly circular piece from a ware 8 jar. The fabric is Roman
Diameter 35mm, thickness 8mm, diameter of hole 5mm, weight 9.5g.
SF 4724, D, u/s.

6.80 Near circular piece from a ware 4 jar. The fabric is Roman.
Diameter 45mm, thickness 5mm, diameter of hole 5mm, weight 13.5g.
SF 12249, M 4906, abandonment build-up, 450–600.

6.81 Near circular piece (broken), from a ware 96 amphora. The fabric is Roman.
Diameter 48mm, thickness 15mm, diameter of hole 11mm, weight 12.0g (26.5g).
SF 6902, C 24, robber spoil, 1750+.

6.82 Near circular piece (broken), from a tile. The fabric is probably Roman.
Diameter 68mm, thickness 22mm, diameter of hole 15mm, weight 57.5g (115.5g).
SF 4284, D 402, destruction level, 1750+.

6.83 Near circular piece (broken), from a tile. The fabric is Roman.
Diameter 75mm, thickness 18mm, diameter of the hole 17mm, weight 70.0g (116.0g).
SF 7052, F 3001, topsoil, 1750+.

6.84 Irregular piece (broken), from a tile. The fabric is probably Roman.
Diameter 86mm, thickness 24mm, diameter of the hole 12mm, weight 108.0g (216.5g).
SF 10167, K 4431, robber-trench fill, 1750+.

6.85 Near circular piece (broken), from a tile. The fabric is probably Roman.
Diameter 85mm, thickness 20mm, diameter of the hole 9mm, weight 89.0g (178.0g).
SF 4019, D 414, cobbled surface 1750+.

6.86 Near circular piece (broken), from a tile The fabric is probably Roman.
Diameter 80mm, thickness 20mm, diameter of hole 14mm, weight 80.5g (160.5g).
SF 7053, F 3001, topsoil, 1750+.

Chipped edges with partly cut central hole

6.87* Near circular piece from a tile. On each side of the centre of the disc there are the beginnings of drill holes. However, the hole was never completed. The fabric is probably Roman.
Diameter 71mm, Thickness 19mm, weight 103.0g.
SF 2662, B 336, fill of ditch cutting the Roman road, 175–250.

LIDS

6.88 Originally the lid of a cooking pot that has been chipped and ground down to make it smaller – probably to fit a jar or amphora The fabric is ware 1.
Diameter of rim 80mm, diameter of handle 30mm.
SF 1141, A 11, robber spoil, 1750+.

SYMMETRICAL PIECES (Fig 6.6)

It is perhaps significant that none of the pieces that were manufactured as roundels, (as opposed to ceramics that were re-used as roundels), come from contexts that date before 450, and the majority are in ware 14, a fabric which does not occur in quantity before the 5th century. Conventions for measurements are the same as those used for ceramic roundels. All pieces found are described.

PIECES WITHOUT CENTRAL HOLES

6.89* Broken. Hand-made. The fabric is similar to ware 14.
Diameter *c* 45mm, thickness, max 17mm, min 11mm, weight 32.5g (49.0g).
SF 8375, F 3051, robber-trench fill, 1750+.

6.90* Broken, impressed holes made with a sharp tapering cylindrical instrument on one surface. Hand made. Orange-buff fabric.
Diameter 38mm, thickness 15mm, weight 15.0g (23.0g).
SF 12235, M 4902, rubble spread, 450–600.

6.91* Slightly chipped, recess in centre of top. Wheel-thrown.
Diameter, top 39mm, bottom 34mm, height 30mm, weight 45.5g (47.0g).
SF 3288, C 4097, cobbled surface of berm, 450–500.

PIECES WITH CENTRAL HOLES

6.92* Biconical with an incised zigzag pattern. The fabric is ware 14.

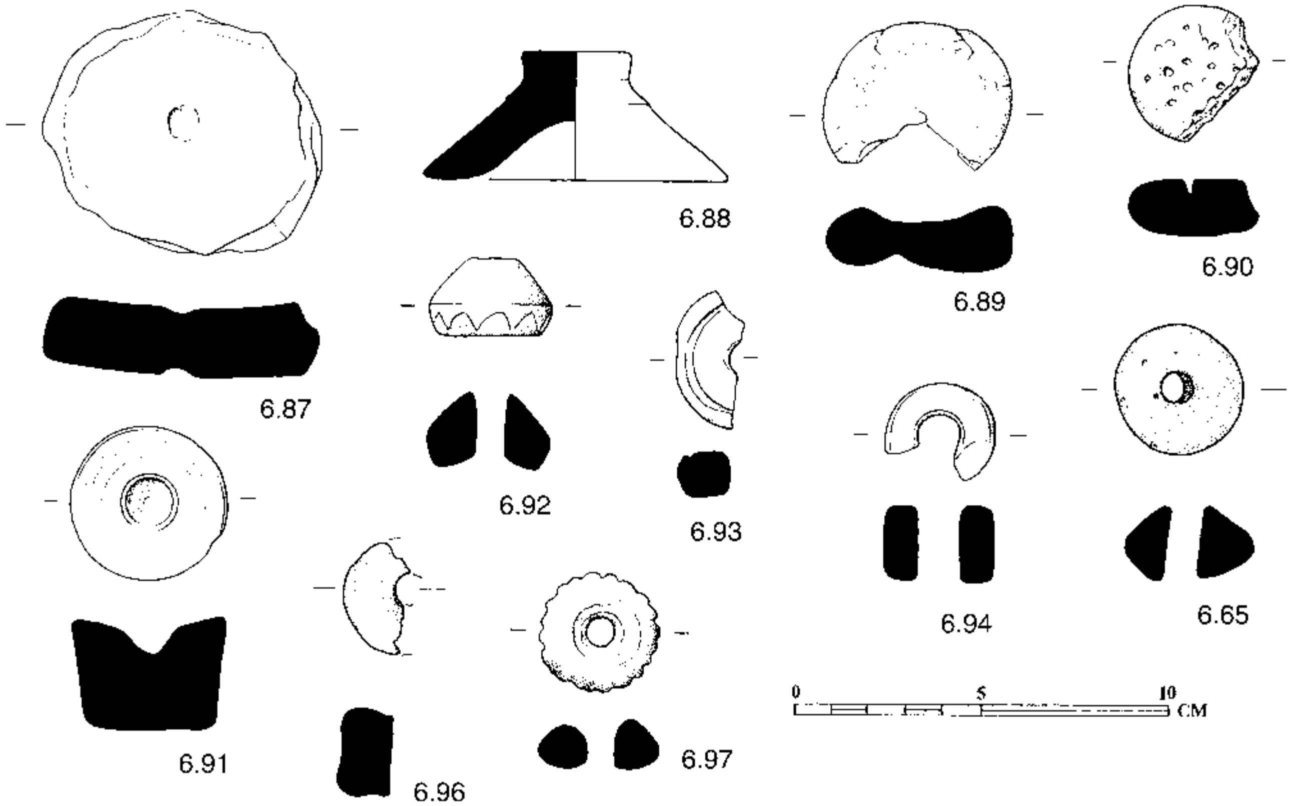


Fig 6.6 Symmetrical ceramic Pieces

Diameter 32mm, thickness 24mm, diameter of the hole 8mm, weight 18.5g.
SF 5032, A 2011, occupation level, 450–600.

6.93* Disc shaped piece, broken, with incised lines on top and bottom concentric with the central hole. The fabric is ware 1.
Diameter 40mm, thickness 11mm, diameter of the hole *c* 10mm, weight 7.5g (18.5g).
SF 14169, P 5018, make-up for the primary floor of the tower, *c* 450.

6.94* Cylindrical, broken. The fabric is orange, grainy with a sandy feel.
Diameter 28mm, thickness 29mm, diameter of the hole 12mm, weight 12.0g (21.5g).
SF 14455, C 96, occupation surface, 450–600.

6.95* Rounded-biconical shape with a lopsided hole. The fabric is ware 14.
Diameter 34mm, thickness 20mm, diameter of the hole 10mm, weight 20.0g.
SF 3050, E 1031, levelling dump of rubble and clay, 450–600.

6.96* Cylindrical, broken. The fabric is ware 14.
Diameter 35mm, thickness 23mm, diameter of the hole 9mm, weight 10.0g (33.5g).
SF 3023, E 1018 robber-trench fill, 1750+.

6.97* Disc shaped with notch decoration on the outer edge. The fabric is ware 14, burnished.
Diameter 32mm, thickness 14mm, diameter of the hole 7mm, weight 13.5g.
SF 5263, A 2235, occupation surface around early Byzantine oven, 450–600.

6.98 Disc shaped, broken and burnt. Indeterminate fabric.
Diameter 36mm, thickness 9mm, diameter of the hole 10mm, weight 5.0g (10.5g).
SF 14436, A 2215, primary collapse/backfill in ditch, 450–500.

6.99 Biconical, broken. The fabric is reddish brown with a few white and black grits visible in section.
Diameter 27mm, thickness 17mm, diameter of the hole 10mm, weight 5.5g (11.5 g).
SF 14904, A 2234, abandonment build-up, 450–600.

LOOM WEIGHTS (Fig 6.7)

6.100* Conical loom weight with transverse hole towards the narrow end. Chipped. The fabric is red brown, gritty, with grog and some organic inclusions.
Height, extant 104mm, probable 110mm, diameter at base, (probable) 88mm, weight 451.0g (*c* 550g).
SF 5143, A. 2130, backfill of defensive ditch, 450–500.

6.101* Trapezoidal loom weight with transverse hole towards the narrow end. The fabric is similar to 6.100.
Height 155mm, diameter at base 75mm, weight 1Kg.
SF 4672, D 676, 175–250.

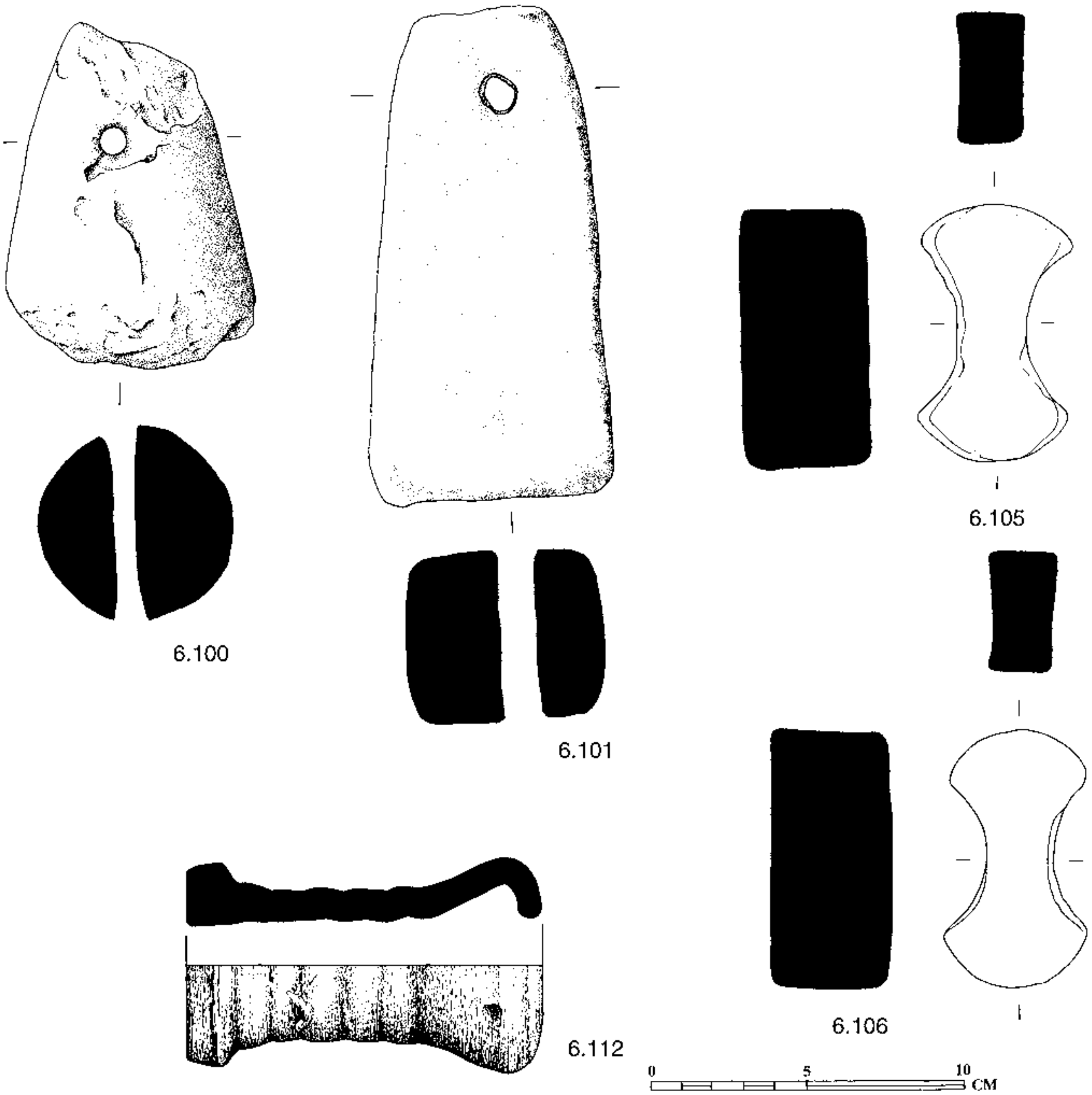


Fig 6.7 Loom Weights and miscellaneous ceramic Objects

MISCELLANEOUS OBJECTS (Figs 6.7 and 6.8)

The following are examples of the different types of ceramic architectural pieces that were found.

TILES

Numerous floor tiles came from the two basilicas. These have been described (Poulter 1995, 158–162,181–2).

6.102* ‘Laconian’ roof tile. The fabric is buff to pink. Length 530mm, width 165mm, thickness 26mm.
SF 8053, F, u/s.

6.103 Small fragment from a tile with translucent green glaze over an indeterminate sgraffito design. Pinkish buff fabric with quartz and mica.
SF 14582, C 4097, cobbled surface of berm, 450–500.

WATER PIPES

6.104* Water pipe with socketed ends. Buff to pink fabric.
Length 54.5. Average internal diameter 96mm, average thickness 25mm.
SF 6561, C 4073, *in situ* in water-pipe trench, 130–200.



Figs 6.8 Roof Tile and ceramic Water Pipe

OPUS SECTILE

All the examples are slightly tapering: the dimensions on one face are slightly smaller than those on the other, usually by between 5 and 2mm. The dimensions quoted below are for the larger face. All are in a pinkish-yellow gritty fabric, a coarser version of ware 4.

6.105* Lime mortar on the smaller face, worn on the larger face.
Length 80mm, width, max 48mm, min 21mm, thickness 39mm,
SF 5122, A 2118, backfill of the late Roman defensive ditch, 450.

6.106* Evenly burnt on the larger face which is worn.
Length 81mm, width, max 43mm, min 21mm, thickness 37mm,
SF 4471, D 607, lower pit-fill, 400–450.

6.107 Lime mortar on the larger face.
Length 84mm, width, max 47mm, min 21mm, thickness 39mm.
SF 5120, A 2118, backfill of the late Roman defensive ditch, *c* 450.

6.108 Length 78mm, width, max 40mm, min 21mm, thickness 39mm.
SF 4381, D 563, topsoil, 1750+.

6.109 Worn on the larger face.
Length 83mm, width, max 47mm, min 25mm, thickness 38mm.
SF 14774, F 3139, demolition level, 1750+.

6.110 Evenly burnt on the larger face which is very worn.
Length 81mm, width, max 45mm, min 26mm, thickness 36mm,
SF 3268, E 1055, occupation level, 450–500.

6.111 Lime mortar on the smaller face.
Length 83mm, width, max 50mm, min 25mm, thickness 39mm.
SF 4313, D 535, pit-fill, 1750+.

WALL SPACERS

6.112* This find is covered in lime mortar.
Length 109mm, diameter max 67mm.
SF 12427, M.5501, cleaning layer, u/s.

TOBACCO PIPES – CHIBOUKS (Fig 6.9)

Terminology follows Simpson (1990).
All pipes are from post-medieval contexts, or are unstratified.

6.113* Head with rim missing. There is a very faint band of rouletting on the shank end and rouletted band forming small rectangular impressions, flanked by two incised lines on the shank to shank-end join. There is a similar design on the

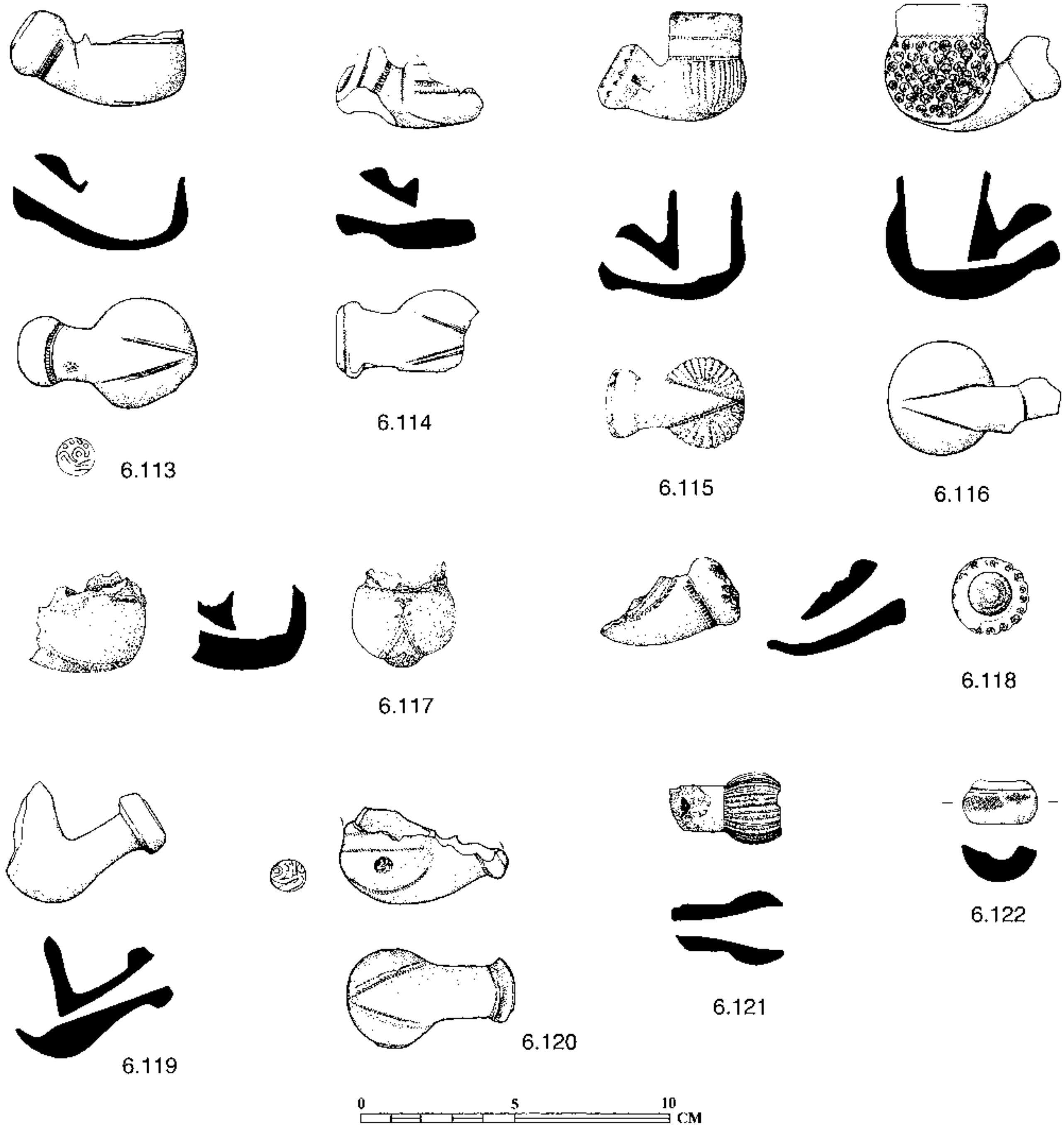


Fig 6.9 Tobacco Pipes – Chibouks

shank-bowl join. Two incised lines are also just visible towards the top of the bowl. Stamp on the shank. The clay is yellowish brown with no visible inclusions except mica. The surface is slipped and the exterior burnished.
SF 14021, M, u/s.

6.114* Shank with part of the bowl (which is compressed) and lower part of the rim. The terminal end of the shank is decorated with a fine band of rouletted triangles, and the shank to shank end join has a rouletted band of small rectangles. The shank-bowl join has the same rouletted pattern as the terminal end, flanked by two incised lines. The bowl-rim join has two bands of rouletted triangles and above, on the rim, there is more rouletting of an indeterminate nature. The fabric is reddish brown with no inclusions visible except mica (ware 10). The slip is of the same clay and burnished on the exterior.
SF 6901, C 12, topsoil, 1750+.

6.115* Nearly complete head, part of rim missing. There is a pattern of roughly cut triangles on the shank-end, and a faintly rouletted beeded pattern on the shank-shank end join. The shank-bowl join has a fine rouletted pattern of a double row of squares, and there are other rows of single rouletted squares on the rim-bowl join, and half way up the rim. The bowl is gadrooned. The clay is

yellowish brown with no visible inclusions except mica. The slip is from the same clay and is burnished on the exterior; it is slightly worn on the keel. The interior of the top part of the rim is blackened from burning.
SF 1114, C 24, robber spoil, 1750+.

6.116* Nearly complete head: part of rim and shank end missing. Rouletted zig-zag band on rim-bowl join; the bowl is completely covered by a repeated rayed dot motif except for the area immediately above the shank. There is a fine rouletted band of tiny square impressions on the shank-bowl join, which is repeated on the shank-shank end join. The shank-end is badly damaged, but an incised line is discernable towards the termination, and cut triangles with chevrons impressed in them occur on the upper half. The clay is reddish brown with no visible inclusions except mica. A slip of the same clay covers the surface except the keel where it has worn away. The surface is highly burnished especially on the rim. The inside of the rim is blackened from burning.
SF 7377, F 3034, fill of post-medieval grubenhaus, 1750+.

6.117* Bowl with shank and rim missing. Fine rouletting in a beaded pattern on rim-bowl join. Fine rouletting on shank-bowl join forming tiny rhombus-shaped impressions, flanked by two incised bands which terminate at the front of the bowl in a palm tree-like design. The clay has no visible inclusions except mica, and is badly burnt all over, but was probably originally yellowish brown. (The burning was caused by a fire, not from use).
SF 2001, B 203, ditch-fill, 1750+.

6.118* Shank with small part of the bottom of the bowl. The terminal end of the shank end is decorated with tiny palmettes and chevrons, the shank-shank end join is rouletted with small rectangles flanked by an incised line. There is a rouletted band of tiny diamond shaped impressions on the shank-bowl join, flanked by two incised lines. There is also rouletting on the bowl, but not enough survives to determine the pattern. The fabric is yellowish brown with no visible inclusions except mica. There is an orange brown slip burnished on the outside.
SF 2134, B 201, topsoil, 1750+.

6.119* Simple head with rim missing. The pipe is undecorated and unslipped though it is burnished. The clay is light pinkish yellow with a few small white inclusions and a little mica. The top part of the inside of the bowl is blackened from burning.
SF 14558, K 4433, pit-fill, 1750+.

6.120* Half complete head. The shank end has an incised line on the terminal end and there is a rouletted line of rectangular impressions on the shank-shank end join that slightly overlaps at the ends of the pattern. The shank-bowl join has a rouletted band of tiny triangles, flanked by an incised line. There is a rouletted band of triangles towards the top of the bowl, and a band of rectangles at the bottom of the rim. There is a stamped monogram on the side of the bowl. The fabric is dark brown toward the inside, a lighter brown toward the outside and there are no visible inclusions except mica. There is a dark red slip, heavily burnished on the outside to give a lustrous finish except under the keel where it is partly worn off. The interior of the bowl and lower part of the stem socket are blackened from burning.
SF 1106, C 24, robber spoil, 1750+.

6.121* Shank and shank end. Fine rouletting around shank-shank end join; fine rouletted lines on shank end with two incised lines between each rouletted line. The clay is yellow-brown with no visible inclusions except mica. A burnished slip covers the surface except the keel where it has been worn away.
SF 1109, C 24, robber spoil, 1750+.

6.122* Part of a multi-component mouth piece (?). There is an incised line at one end and very faint lattice decoration covering the widest part of the piece, presumably rouletted. The clay is reddish brown with no visible inclusions except mica. The surface is burnished.
SF 8062, F 3001, topsoil, 1750+.

6.123 Small fragment of shank with shank end. The shank end has rouletted decoration giving the impression of small parallelograms; the rouletted band does not join neatly at the end, but is slightly overlapped. The clay is yellowish brown with no visible inclusions except mica. The surface has a burnished reddish brown slip.
SF 14545, K 4405, topsoil, 1750+.

6.124 Small fragment from a gadrooned bowl with fine rouletting giving tiny square impressions between the gadroons. The fabric is yellowish brown with a grey core, no visible inclusions except mica. (Though no tests have been done on any of the wares found at Nicopolis this is very likely the same as ware 10). There is a slip of the same clay which is burnished on the exterior.
SF 1067, C 20, topsoil, 1750+.

WARE DESCRIPTIONS

Ware 1. Black to grey and sometimes brown with black, grey or brown surface, crumbly fracture. The fabric contains white grits and quartz, usually in large quantities, and some mica. Thickness: 4–.8mm.

Ware 4. The same as ware 8 but with no slip.

Ware 8. Light brown to buff with a red slip on the exterior or a buff to pink surface where there is no slip. The fracture is very sharp, sometimes splintered. The fabric is well levigated and contains a few small black and/or white grits and often some mica. Often no inclusions are visible with the naked eye. Thickness: 4–8mm.

Ware 10. Reddish-brown, often with a grey core and reddish-brown surface, moderate fracture. The fabric contains a few black grits and much mica: generally clean apart form the mica. Thickness: 5–7mm.

Ware 14. Grey with a grey to black surface (occasionally brown with a brown surface), which is often pattern-burnished, moderate fracture. The fabric contains a small amount of quartz and some mica; generally little apart from the mica. Thickness: 6.0mm.

Ware 23. Amphora. Reddish-brown with a light brown core and a reddish-brown surface, moderate fracture. The fabric contains many shiny black (volcanic?) and a few red and white grits. Thickness: 8mm.

Ware 37. Amphora. Brick red with a dull orange surface on the interior and a white slip on the exterior with a moderate fracture, shallow external ribbing. The fabric contains some limestone, a few voids and rounded grey grits and a few small quartz grits and a little mica. Thickness: 9mm.

Ware 41. Brown with a light to dark brown surface with gold mica plates visible, moderate fracture. The fabric is grainy and contains quartz and a few black and white grits. Thickness: *c* 14mm.

Ware 96. Amphora. Brick red with a brick red surface with a moderately crumbly fracture. The fabric contains some quartz and angular black grits, a few voids and some mica. Thickness: 8mm.

7

THE LAMPS

by

Rob Falkner

During the excavations, *c* 350 lamp fragments were recovered, 230 of which could be assigned to a particular type. The remainder were either undiagnostic base fragments or were too small for identification. The vast majority were the products of local kiln sites, none of which come from contexts dated before *c* 150, and very few from contexts dated earlier than *c* 250: the 3rd and early 4th centuries seems to have been the period when lamps were most commonly in use. Few examples of imported lamps were found and, of these, the factory lamps all date to the early 2nd century. Those from later contexts must be residual.

In the catalogue, the lamps are divided into groups according to the size and position of their filler holes; large, small central, unknown (most of which are probably small central), and off-centre/ multiple. Not all of the lamps are illustrated. Figure 7.1 covers the principal conventions used to describe the different decorative elements on the shoulders. Terms such as ‘plain’, ‘ridged’ and ‘knob’ are also used where their meaning is obvious. The decoration at the edge of the lamp is described first, then the next element, working inwards to the discus, eg, in the case of lamp 7.1 the outer shoulder element consists of rosettes, and the inner consists of a triple ridge. This is abbreviated to ‘the shoulder

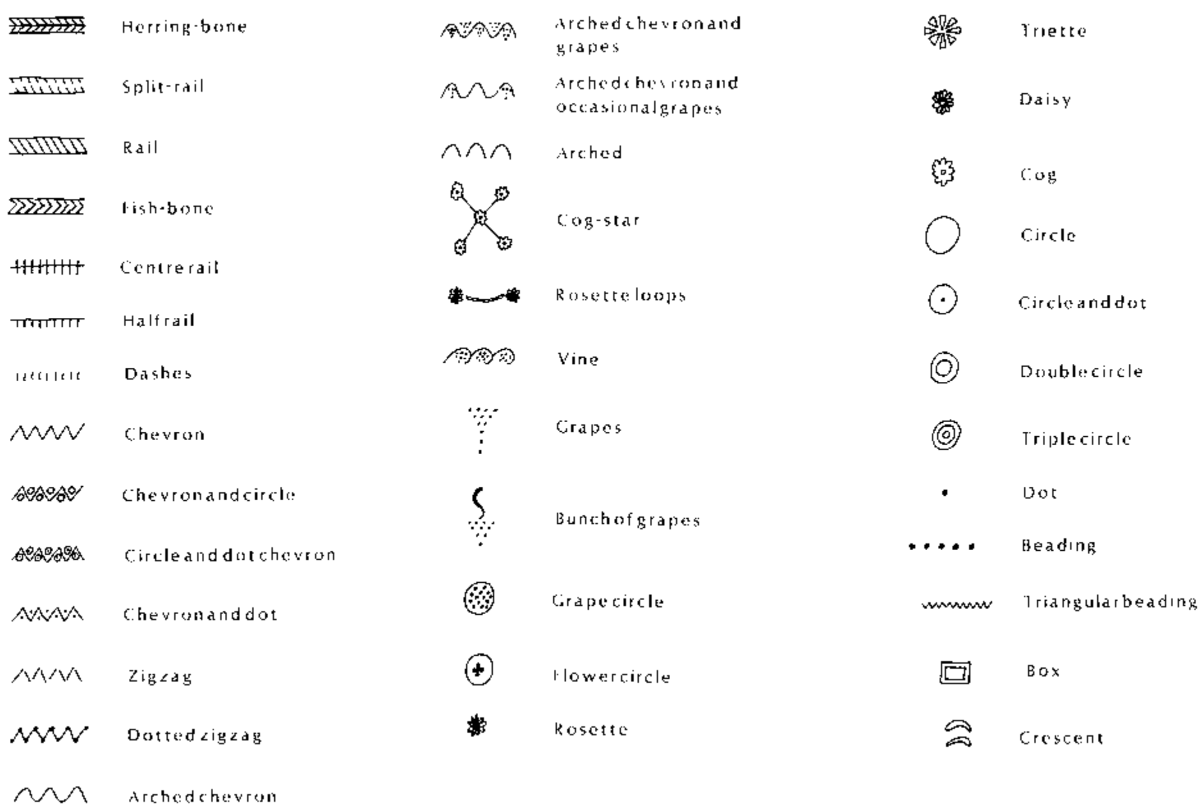


Fig 7.1 Decorative elements on lamps

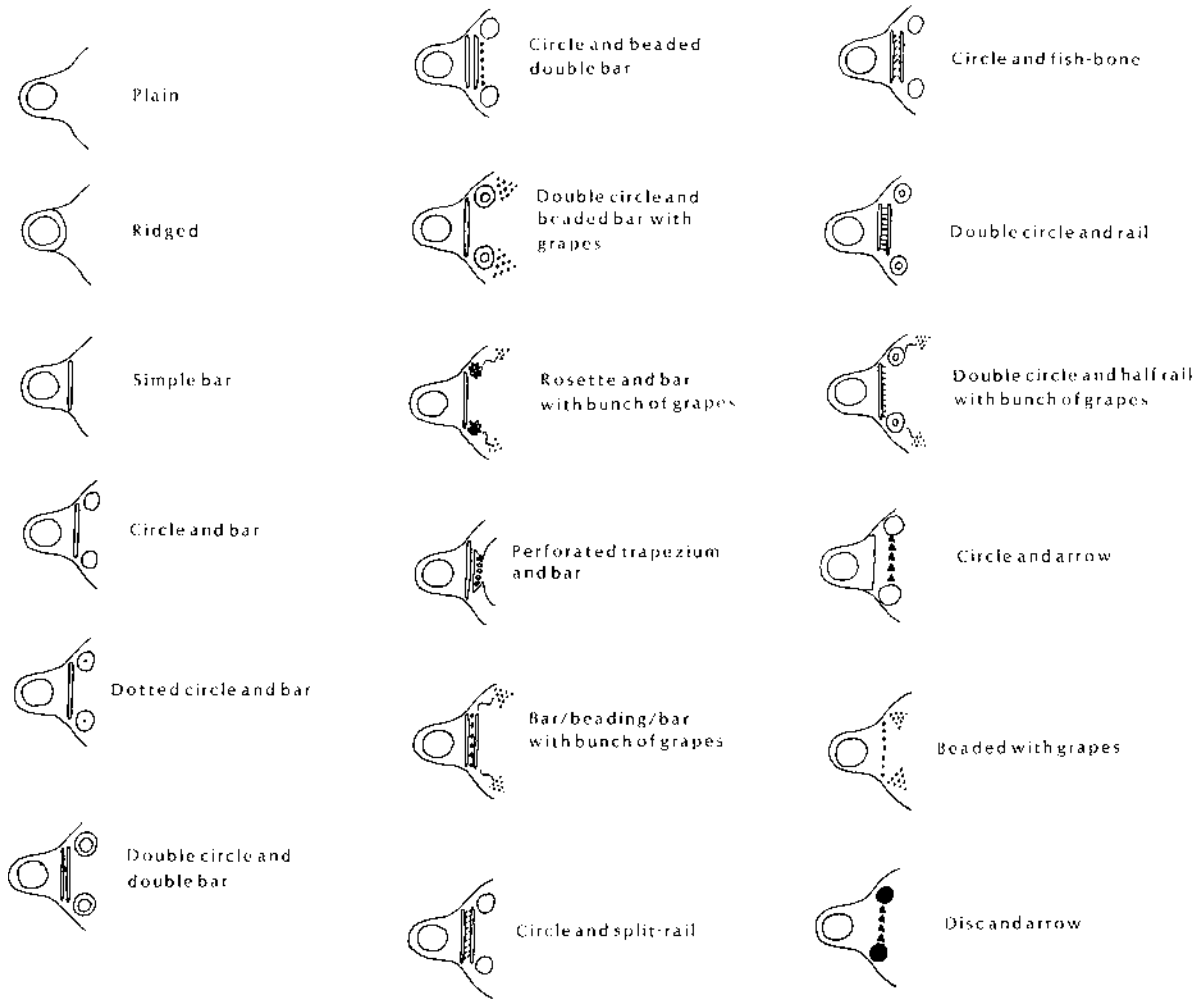


Fig 7.2 Types of Lamp Nozzles

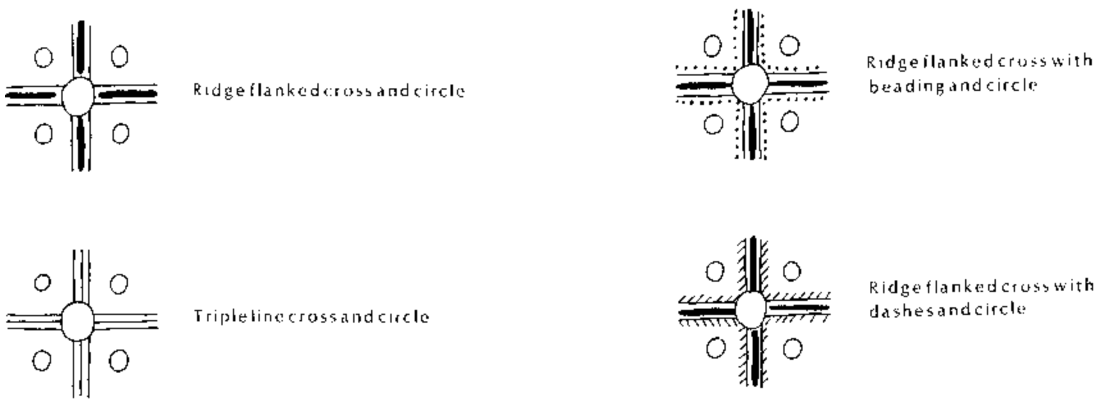


Fig 7.3 Types of Spoke Decoration on Lamp Disca

consists of rosettes and a triple ridge.' The nozzles, too, can be divided into different types, illustrated in Figure 7.2. Several lamps have spoke decoration on their disca, and the basic variations are shown in Figure 7.3. Where the circles are more elaborate, the same terms are used as for the decorative elements on the shoulders. Where the term 'star' is employed instead of 'cross' this indicates that more than four spokes are present. The terms used to describe the handles are as follows; pierced keel, broad loop, knob, keel knob.

Note. Apart from multi-nozzles, lamps are drawn with nozzle to the left. All lamps are red-slipped unless otherwise stated. Sometimes the same small-find number refers to more than one lamp. This occurs when pieces of different lamps have been mistakenly catalogued as a single find.

LOCAL LAMPS

There is clear evidence for local lamp production (Sultov 1976 and 1985) and in the same fabric as the local red-slipped pottery (ware 8, below and Falkner in Poulter 1999, 74). All the common types of local lamps were made in moulds, the method employed by Roman lamp makers throughout the Empire. Several variations were produced, but all are circular with the exception of some special multi-nozzle examples.

LARGE FILLER HOLE (Fig 7.4)

This first group have very large filler holes, so large that the discus as such is absent.

7.1* The shoulder consists of rosettes and a triple ridge. The nozzle is circle and arrow, the handle pierced keel.
SF 4301, D 531, contaminated cleaning level.

7.2* The shoulder is chevron and dot outside a rail.
SF 1184, D 422, destruction level, 1750+.

7.3* The shoulder consists of chevron and dot decoration outside a triple ridge with a dotted circle and bar nozzle. Worn brown slip.
SF 14430, D 607, lower pit-fill, 400–450.

7.4 The shoulder consists of plain and split-rail. Broad loop handle.
SF 4289, D 449, dump deposit, 1750+.

7.5 The shoulder consists of chevron and herring-bone.
SF 15032, P 5024, dump of destruction debris, 250–300.

7.6 The shoulder consists of chevron and double ridge, with circle and bar nozzle.
SF 14591, C 4033, backfill of ditch, 450–500.

7.7 The shoulder consists of plain and split-rail.
SF 2517, D 559, destruction deposit, 375–450.

7.8 Part of a circle and fish-bone nozzle.
SF 4277, D 511, clay floor, 450–600.

7.9 The shoulder consists of chevron and split-rail decoration.
SF 1230, D 451, tumble of stones probably from a wall outside the area, 1750+.

7.10 The outer part of the shoulder is indeterminate and the inner is fish-bone. Pierced keel handle. Lustrous brown slip.
SF 14956, D 682, pit-fill, 400–500.

7.11 The shoulder consists of zigzag and triple ridge. Pierced keel handle.
SF 15046, K 4507, surface outside building, 300–450.

7.12 Broad loop handle. Brown slip.
SF 14938, M 4928, demolition deposit, 1750+.

7.13 Fragment of a circle and split-rail nozzle, showing burning.
SF 4279, D 449, dump deposit, 1750+.

7.14 The shoulder consists of plain and fish-bone.
SF 14978, F 3139, demolition level, 1750+.

7.15 The shoulder is plain and fish-bone.
SF 14975, C 5306, burnt dump, backfilling defensive ditch 3, 250–350.

7.16 The shoulder consists of alternating chevrons and double circles outside split-rail.
SF 14587, F 3011, demolition level, 1750+.

7.17 The shoulder consists of dotted zigzag, ridge and crude split-rail.
SF 14276, P 5021, dump of destruction debris, 250–300.

7.18 The shoulder consists of triangular beading and split-rail. The handle is a pierced keel.
SF 14554, K 4408, wall of narthex, 450–600.

7.19 The shoulder consists of circle and dot chevrons and fish-bone.
SF 14472, K 4506, floor of building, 300–450.

SMALL CENTRAL FILLER HOLE (Fig 7.4)

7.20* The outer shoulder consists of poorly modelled knobs, daisies and unidentifiable designs outside a triple ridge. The discus has four unidentifiable designs on it. The nozzle is a double bar type. The handle is a keel knob. Double ring base (as on 7.48). Lustrous brown slip on the top and over the top of the walls. Signs of burning at the nozzle.
SF 10001, K 4401, topsoil, 1750+.

7.21* The shoulder consists of radial crescents, a poorly executed rail design and a ridge. The discus is plain. The nozzle is a circle and beaded double bar. Pierced keel handle. Single ring base.
SF 12186, M 4878, make-up deposit, 200–250.

7.22* The shoulder consists of rosettes, beading and single ridge with two knobs. The discus has alternating daisies and triettes. Keel knob handle.
SF 4639, D 670, pit-fill, 200–300.

7.23* The shoulder consists of rosettes outside a triple ridge. The discus is plain. Small keel knob handle. Burnt after breaking.
SF 4627, D 667, dump deposit of industrial waste, 175–250.

7.24* The shoulder is plain outside double half rails. The discus is plain. Pierced keel handle.
SF 3021, E 1008, robber-trench fill, 1750+.

7.25* The shoulder is repeated circles outside fish-bone. The discus is plain. The nozzle is double circle and rail.
SF 4312, D 536, silty build-up, 400–450.

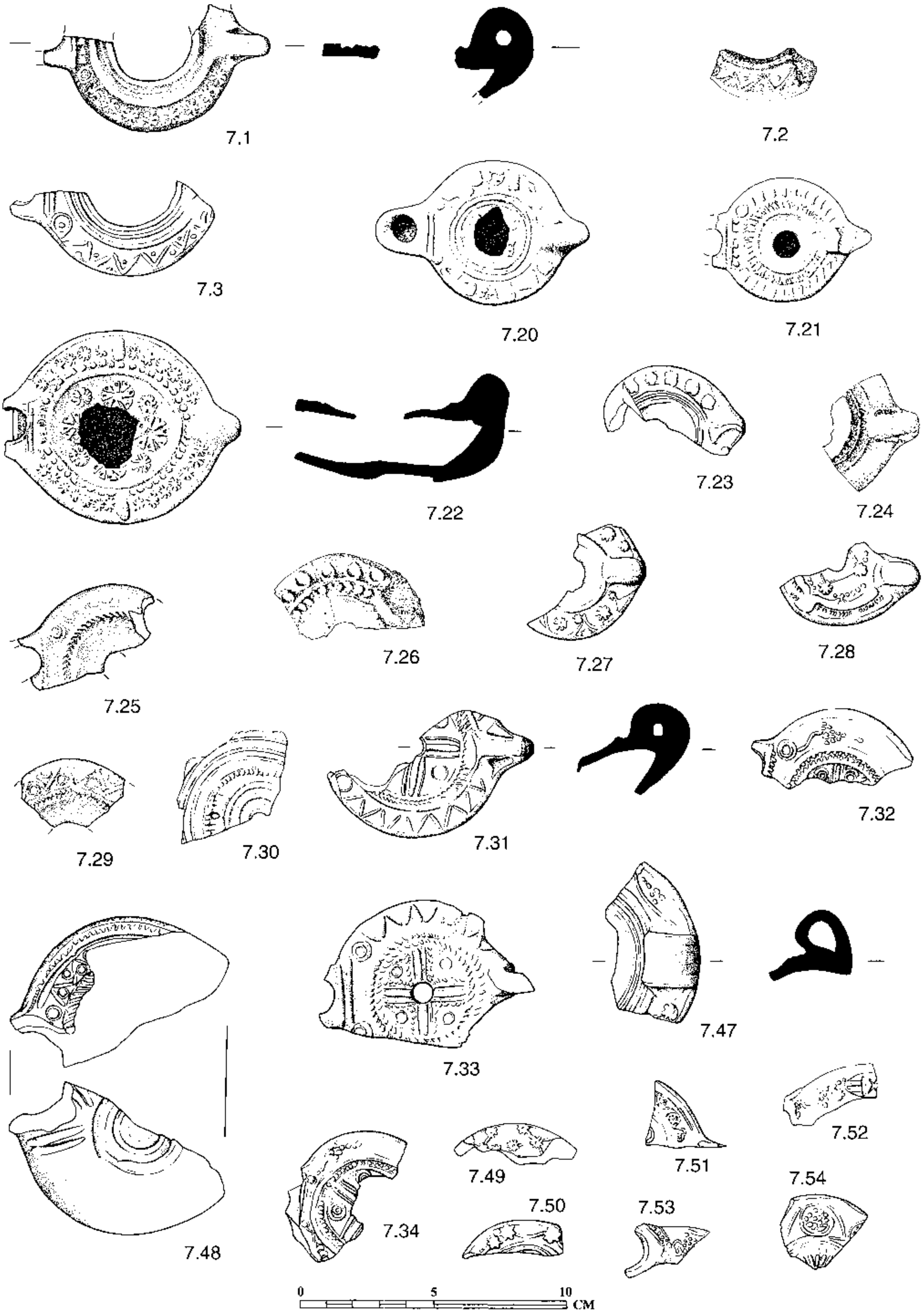


Fig 7.4 Local Lamps

7.26* The shoulder is repeated circles outside a rail. The discus is plain. Brown slip.
SF 1068, C 12, topsoil, 1750+.

7.27* The shoulder consists of a row of arches with large and small rosettes inside, and a small rosette between arches, inside there is a ridge, The discus is plain. Keel knob handle.
SF 15028, K 4499, soil accumulation over floor of building, 400–500.

7.28* The shoulder consists of a row of dashes with knobs and a ridge. The discus has a row of beading at the top and joined rosettes around the hole. Keel knob handle.
SF 12230, M 4896, occupation surface,1750+.

7.29* The shoulder is chevron and circle outside fish-bone, the discus is plain. Lustrous brown slip.
SF 1224, D 421, rubble, 1750+.

7.30* The outer shoulder is missing; the inner shoulder has a triple ridge, the discus has radial and concentric ridges. No slip.
SF 14535, K 4431, robber-trench fill, 1750+.

7.31* The shoulder consists of chevrons outside split-rail, the discus is a ridge flanked cross and circle type. Keel pierced handle.
SF 10217, K 4505, soil accumulation over floor of building, 400–500.

7.32* The shoulder is plain and fish-bone, the discus is a ridge flanked cross and double circle. The nozzle is a double circle and half rail with bunch of grapes, showing signs of burning.
SF 15020, K 4512, make-up deposit, 300–450.

7.33* The shoulder is zigzag outside split-rail, the discus is ridge flanked cross with beading. The nozzle is a double circle and double bar. The handle is a pierced keel.
SF 10124, K 4405, topsoil, 1750+.

7.34* The shoulder is plain outside ridge beading, ridge. The discus is a ridge flanked cross and double circle. The nozzle is a rosette and bar with bunch of grapes.
SF 15009, E 1110, make-up deposit, 450–600.

7.35 The shoulder is repeated circle and dot outside a double ridge. The discus is faint but would appear to be a triple line cross and dotted circle.
SF 14231, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

7.36 The shoulder consists of arched chevrons and grapes outside a rail. The discus is a ridge flanked cross with double circle. Lustrous brown slip.
SF 3059, E 1031, levelling dump of rubble and clay, 450–600.

7.37 The shoulder consists of radial ridges outside a ridge. The discus is a ridge flanked cross. Pierced keel handle.
SF 8374, F 3051, robber-trench fill, 1750+.

7.38 The shoulder consists of grape and vine alternating with rosettes, then ridge, rail, ridge; the discus is missing.
SF 15012, K 4512, make-up deposit, 300–450.

7.39 Indeterminate outer shoulder, the inner shoulder is a triple ridge, the discus is plain.
SF 3162, E 1035, topsoil, 1750+.

7.40 Indeterminate outer shoulder, split-rail inner. Plain discus.
SF 14989, F 3287, construction levelling, 450–600.

7.41 The shoulder consists of radial ridges and fish-bone. The discus has a ridge flanked star design, (probably five arms). The nozzle is a beaded double bar.
SF 15047, D 600, pit-fill, 400–450.

7.42 The shoulder consists of chevron and circle decoration and double ridge. The discus is plain.
SF 3354, E 1222, dump layer, 450–500.

7.43 The shoulder is plain outside a double ridge. The discus is plain. Pierced keel handle.
SF 15069, K 4499, soil accumulation over floor of building, 400–500.

7.44 The shoulder consists of radial ridges outside a rail. The discus is plain.
SF 3206, E 1036, occupation surface, 450–600.

7.45 The shoulder consists of triangular beading around the perimeter and split-rail inside. The discus is plain. Pierced keel handle.
SF 8127, F 3250, floor make-up for a post-medieval grubenhaus, 1750+.

7.46 The outer shoulder is missing; the inner is a rail. The discus is plain.
SF 8352, F 3360, dump deposit, 250–350.

Unknown filler hole (probably nearly all central) (Figs 7.4 and 7.5)

7.47* The shoulder consists of grape and vine decoration alternating with rosettes, four ridges; the discus is plain. Broad loop handle.
SF 15018, K 4417, tiled floor, 1750+.

7.48* The shoulder consists of triangular beading, ridge, chevron and circle and either herring-bone or split-rail, the rest is missing.
SF 8187, F 3256, pit-fill, 1750+.

7.49* The outer shoulder consists of cog-stars, the rest is missing.
SF 15029, D 600, pit-fill, 400–450.

7.50* The outer shoulder consists of rosette loops; there are three ridges visible on the inner, the rest is missing.
SF 15010, F 3011, demolition level, 1750+.

7.51* The shoulder consists of ridge, delicately executed vines and ridge. Part of an indeterminate design is visible in the discus. Pierced keel handle.
SF 15024, K 4495, floor of grubenhaus, 1750+.

7.52* The outer shoulder consists of grapes, rosettes and a foot, the rest is missing. The nozzle is ridged.
SF 14328, P 5025, dump deposit, 250–300.

7.53* Fragment of a bar/beading/bar and grapes nozzle.
SF 14573, K 4405, topsoil, 1750+.

7.54* The shoulder consists of grape circles within arches and a furrow. The discus has radial ridges at the outer edge, the rest is missing. The style of this example is slightly different from the rest of the lamps in that there is no clear cut boundary to the discus.
SF 15025, K 4463, post-medieval robbing debris, 1750+.

7.55* The outer shoulder consists of chevron and circle decoration, the rest is missing.
SF 3037, E 1031, levelling dump of rubble and clay, 450–600.

7.56* The shoulder consists of radial ridges and triple bar. The nozzle is disc and arrow.
SF 5250, A 2218, primary collapse/backfill in defensive ditch, 450–500.

7.57* The shoulder consists of radial ridge and double ridge. The discus is plain.
SF 15068, E 1110, make-up deposit, 450–600.

7.58* The shoulder consists of radial ridges and triple ridge. The discus is probably plain. Pierced keel handle. Small circle and bar nozzle. Triple ring base.
SF 4212, D 451, tumble of stones probably from a wall outside the area, 1750+.

7.59* The shoulder consists of plain, dashes and triple ridge. The nozzle is beaded with grapes.
SF 4959, E 1110, make-up deposit, 450–600.

7.60* The shoulder is chevron and dot, outside fish-bone, the discus is plain. Keel pierced handle and ring base. Brown slip.
SF 1122, D 417, foundation layer, 1750+.

7.61* The shoulder is plain and half rail and ridge. The nozzle is small circle and bar.
SF 4339, D 554, occupation surface, 450–600.

7.62* The shoulder consists of triple circles outside a double ridge. The handle is a flattened keel knob.
SF 14943, K 4512, make-up deposit, 300–450.

7.63* The shoulder consists of arched chevrons with occasional grapes and quadruple ridge. The discus is plain.
SF 1198, D 404, destruction level, 1750+.

7.64 Part of a nozzle. Dusky red slip.
SF 14969. K 4479, robbing debris, 1750+.

7.65 Broad loop handle.
SF 14942, K 4516, rubbish deposit, 250–350.

7.66 Broad loop handle. Brown slip.
SF 14941, K 4499, soil accumulation over floor of building, 400–500.

7.67 Part of nozzle. Dusky red slip.
SF 7013, F 3001, topsoil, 1750+.

7.68 The shoulder consists of chevrons, the rest is missing.
SF 14017, D 628, silty build-up, 450–600.

7.69 Same as 7.55.
SF 14453, E 1013, levelling of the berm, 450–600.

7.70 The outer shoulder consists of circle and dot chevrons; the rest is missing. Broad loop handle.
SF 14472, K 4506, floor of building, 300–450.

7.71 Keel knob handle.
SF 14939, M 4915, dump deposit, 350–450.

7.72 The outer shoulder is missing; the inner consists of ridge, split-rail and ridge. The discus is plain.
SF 14016, D 636, destruction deposit, 375–450.

7.73 The shoulder consists of chevrons outside split-rail. The discus is plain. Pierced keel handle.
SF 4956, D 451, tumble of stones probably from a wall outside the area, 1750+.

7.74 The shoulder is poorly executed and consists of an indeterminate design outside ridge and split-rail. The nozzle is plain.
SF 14979, K 4432, post-medieval robber-trench for north wall of the nave, 1750+.

7.75 The shoulder consists of radial ridges and at least one ridge; the rest is missing.
SF 15070, K 4429, robber-trench fill, 1750+.

7.76 The shoulder is plain outside a rail. The discus is plain.
SF 14977, K 4404, u/s.

7.77 The outer shoulder is repeated double circles, the rest is missing. Pierced keel handle.
SF 15033, F 3297, fill of robber cut, 250–350.

7.78 The outer shoulder is missing; the inner is split-rail. The nozzle is circle and beaded bar with grapes.
SF 15022, D 682, pit-fill, 400–500.

7.79 The outer shoulder is missing; the inner has fish-bone decoration. The nozzle is a double circle and bar.
SF 15015, D 706, occupation deposit, 400–450.

7.80 The shoulder consists of chevrons and triple ridge. The nozzle is circle and rail.
SF 5255, A 2214, backfill of ditch, 450–500.

7.81 Small fragment. The shoulder consists of radial ridges, ridge, fish-bone and ridge. The rest is missing.
SF 15071, K 4515, rubbish deposit, 250–350.

7.82 Small fragment. The outer shoulder is missing; the inner consists of a triple ridge. The nozzle is circle and rail.
SF 4957, D 482, pit-fill, 1750+.

7.83 The shoulder consists of radial ridges and split-rail. The nozzle is a simple bar.
SF 14017, D 628, silty build-up, 450–600.

7.84 The shoulder consists of an outer row of beading, a plain area and a double ridge. Pierced keel handle.
SF 14017, D 628, silty build-up, 450–600.

7.85 The shoulder consists of chevrons and fish-bone. The nozzle is circle and rail.
SF 4370, D 563, topsoil, 1750+.

7.86 The shoulder consists of chevron and circle, ridge, herring-bone and ridge; the discus is plain.
SF 3196, E 1036, occupation surface, 450–600.

7.87 Small fragment. The shoulder consists of triple circles and double ridge. The discus is a ridge flanked cross - presumably with circles.

SF 5196, A 2151, backfill of defensive ditch, 450–500.

7.88 The outer shoulder is missing; the inner shoulder consists of two rows of half rails. The discus is probably a ridge flanked cross type. The nozzle is a rosette bar and rail, probably with grapes.
SF 4311, D 536, silty build-up, 400–450.

7.89 Small fragment. The outer shoulder is missing; the inner consists of split-rail. The discus is ridge flanked cross with dashes and circle.
SF 15014, K 4515, rubbish deposit, 250–350.

7.90 Small fragment. The outer shoulder is missing; the inner consists of a double half rail and ridge. The discus is a ridge flanked cross – presumably with circles.
SF 15045, M 4958, demolition deposit, 200–250.

7.91 The shoulder consists of an indeterminate design of grapes and chevrons outside split-rail. The discus is a ridge flanked cross and double circle.
SF 14070, A 2139, backfill of ditch, 450–500.

7.92 The shoulder is chevron and dot outside a rail. The discus is ridge flanked cross and double circle.
SF 14353, P, u/s,

7.93 The shoulder consists of a zigzag outside split-rail. The discus is ridge flanked cross and circle.
SF 15048, C 4095, floor surface, date uncertain.

7.94 The outer shoulder is missing, the inner consists of a half rail and ridge. The discus is a ridge flanked cross and circle. The nozzle double circle and bar with grapes.
SF 4316, D 542, occupation level, 450–600.

7.95 The outer shoulder is missing; the inner consists of a double row of beading. The nozzle is dotted circle and bar with grapes.
SF 7051, F 3011, demolition level, 1750+.

7.96 The outer shoulder is missing; the inner is split-rail. The nozzle is circle and double bar.
SF 14976, F 3310, make-up deposit, 250–350.

7.97 The shoulder consists of radial ridges and triple ridge. The nozzle is circle and rail.
SF 3104, E 1024, occupation level, 450–600.

7.98 Small fragment of a double circle and bar nozzle.
SF 1147, D 422, destruction level, 1750+.

7.99 Small fragment. The outer shoulder is missing; the inner shoulder consists of ridge, herring-bone and ridge. The nozzle is double circle and beaded bar. The rest is missing.
SF 2227, B 243, secondary surface of cobbled road, 300–450.

7.100 The shoulder consists of plain, ridge, rosettes and ridge.
SF 1233, E 1003, robber-trench fill, 1750+.

7.101 The shoulder is poorly executed and consists of arched chevrons with grapes, ridge, herring-bone and ridge. Pierced keel handle.
SF 14937, C 5306, burnt dump backfilling defensive ditch 3, 250–350.

7.102 The shoulder is plain outside split-rail.
SF 15023, M 4846, robber-trench fill, 275–450.

7.103 The outer shoulder has chevron decoration; the inner is missing. Pierced keel handle.
SF 14574, K 4405, topsoil, 1750+.

7.104 The shoulder consists of chevron and dot and split-rail. The nozzle is circle and bar.
SF 15013, K 4515, rubbish deposit, 250–350.

7.105 Small fragment. The outer shoulder is missing. The inner has rail decoration. Dotted circle and beaded bar nozzle.
SF 14573, K 4405, topsoil, 1750+.

7.106 The shoulder consists of chevron and dot outside a double ridge. Pierced keel handle.
SF 14592, D 554, occupation surface, 450–600.

7.107 Small fragment of a triple circle with bunch of grapes nozzle.
SF 14601, K 4433, pit-fill, 1750+.

7.108 The shoulder is plain outside a double row of beading; the rest is missing.
SF 15016, F 3139, demolition level, 1750+.

7.109 The shoulder is plain and rail. The discus is plain. The nozzle is dotted circle and bar.
SF 12319, M 4915, dump deposit, 350–450.

7.110 The shoulder is plain and split-rail. The nozzle is circle and double bar.
SF 3341, D 1129, dump deposit, 450–500.

7.111 The outer shoulder consists of zigzag decoration; the rest is missing.
SF 14591, C 4033, backfill of ditch, 450–500.

7.112 Small fragment. The outer shoulder consists of at least one rosette, ridge and rail. The rest is missing.
SF 6634, C 4097, cobbled surface on the berm, 450–500.

7.113 The shoulder consists of arched chevrons and grapes and split-rail.
SF 8307, F 3335, dump deposit, 300–400.

7.114 The shoulder is plain outside quadruple ridge. The handle is a broad loop.
SF 14331, P 5020, cultivation soil, 250–350.

7.115 Small fragment. The shoulder consists of chevron and dot and rail decoration.
SF 12503, E 1112, make-up deposit, 450–500.

7.116 The shoulder consists of chevron and circle decoration outside a single ridge.
SF 14591, C 4033, backfill of ditch, 450–500.

7.117 Small fragment. The shoulder consists of a double row of rosettes. The nozzle is plain.
SF 14539, R 5206, soil build-up over tower floor, 500+.

7.118 The shoulder is plain with split-rail.
SF 14556, M 4805, collapsed wall, 1750+.

7.119 Very small fragment of a beaded bar nozzle.
SF 14339, P 5024, dump of destruction debris, 250–300.

7.120 Small fragment. The inner shoulder is split-rail. The nozzle is double circle beaded bar with grapes.
SF 15021, F 3139, demolition level, 1750+.

7.121 Small fragment. The inner shoulder consists of

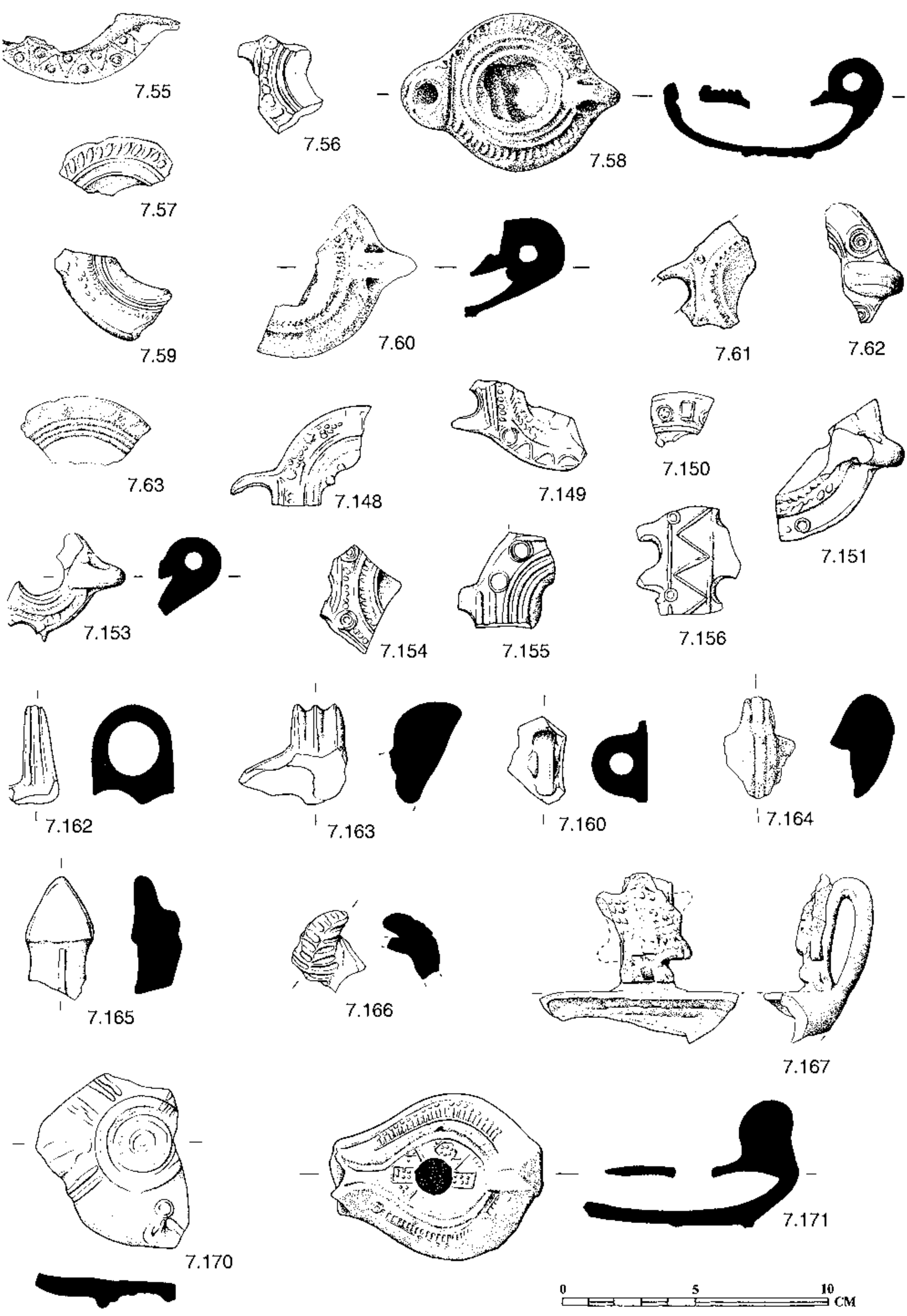


Fig 7.5 Local and imported Lamps

ridge and herring-bone decoration; the rest is missing.
SF 12502, E 1112, make-up deposit, 450–500.

7.122 Small fragment. The inner shoulder consists of split-rail, the discus is plain.
SF 14972, K 4515, rubbish deposit, 250–350.

7.123 The shoulder consists of chevrons and triple ridge. The discus is plain.
SF 3263, E 1036, occupation surface, 450–600.

7.124 Small fragment. The inner shoulder is double ridge and furrow; the discus is plain.
SF 3345, E 1124, clay make-up dump, 450–600.

7.125 Small fragment. The outer shoulder consists of repeated circles and fish-bone. The rest is missing.
SF 6603, C 4110, backfill of ditch, 300–400.

7.126 Small fragment. The outer shoulder consists of chevron and circle decoration. The rest is missing.
SF 14218, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

7.127 The shoulder is plain outside split-rail. Pierced keel handle.
SF 8193, F 3264, backfill of grubenhaus, 1750+.

7.128 Small fragment. The outer shoulder consists of circle and dot chevrons. The rest is missing. Brown lustrous slip.
SF 10124, K 4405, topsoil, 1750+.

7.129 Small fragment. The outer shoulder is chevron and dot decoration, the rest is missing.
SF 4706, D 693, dump deposit, 400–450.

7.130 The shoulder consists of chevron and dot outside a double ridge. Pierced keel handle.
SF 4708, D 701, dump deposit, 400–450.

7.131 Small fragment. The shoulder consists of arched chevron and dot decoration, outside fish-bone.
SF 14071, A 2023, make-up for the berm, between curtain-wall and ditch, *c* 450.

7.132 Small fragment. The shoulder consists of an indeterminate design that includes dots. Lustrous brown slip.
SF 14334, P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

7.133 The outer shoulder consists of poorly executed rosettes, the rest is missing.
SF 14442, A 2234, abandonment build-up, 450–600.

7.134 The shoulder consists of circle and dot decoration and rail. Pierced keel handle.
SF 14433, A 2214, backfill of ditch, 450–500.

7.135 Small fragment. The shoulder is plain and split-rail.
SF 14472, K 4506, floor of building, 300–450.

7.136 Small fragment. The outer shoulder consists of a design including grapes. The rest is missing.
SF 14448, M 4817, silt build-up, 1750+.

7.137 The shoulder is beaded and split-rail.
SF 14974, D 682, pit-fill, 400–500.

7.138 The inner shoulder consists of triple ridge, the rest is missing; the discus is plain.
SF 15003. K 4463, post-medieval robbing debris, 1750+.

7.139 The inner shoulder consists of quadruple ridge, the rest is missing.
SF 14995, D 607, lower fill of pit, 400–450.

7.140 Small fragment. The inner shoulder is triple ridge, the discus is plain. The rest is missing.
SF 14460, C 4052, robber-trench, 1750+.

7.141 Small fragment. The outer shoulder consists of at least one bunch of grapes. The rest is missing.
SF 6636, C 4096, floor surface, date uncertain.

7.142 The shoulder consists of chevrons. Pierced keel handle. No slip.
SF 4343, D 544, trench fill, 400–450.

7.143 The shoulder consists of arched chevron and dot for a quarter of the circumference, then a row of dots, outside a ridge, rosettes and a ridge. Keel knob handle.
SF 15038, K 4509, make-up level, 300–450.

7.144 The shoulder consists of rosettes, herring-bone and ridge.
SF 15030, F 3292, clay make-up for a floor, 400–450.

7.145 The shoulder is plain outside a half rail and ridge.
SF 3121, E 1031, levelling dump of rubble and clay, 450–600.

7.146 The shoulder is plain outside a half rail and bar. The discus is plain. Pierced keel handle.
SF 14592, D 554, occupation surface, 450–600.

7.147 Small fragment.
SF 14472, K 4506, floor of building, 300–450.

Off centre/multiple filler holes (Fig 7.5)

7.148* The shoulder is alternating grape and poorly executed rosette with a faint knob outside a ridge and furrow. There is an indeterminate design in the discus. The nozzle is a perforated trapezium and bar.
SF 15017, K 4515, rubbish deposit, 250–350.

7.149* The shoulder is arched outside a poorly executed split-rail. The discus seems to be plain. The nozzle is circle and beaded double bar.
SF 15034, F 3322, make-up layer, 400–450.

7.150* The shoulder is alternate boxes and flowered circles outside two ridges. Indeterminate design on the discus. Brown slip.
SF 14991, Q, u/s.

7.151* Multiple holed lamp. The shoulder consists of a design including at least one circle and a dot outside a poorly executed fish-bone; the discus is plain. Pierced keel handle.
SF 14441, F 3132, grubenhaus floor, 800–1000.

7.152 Small fragment. The shoulder consists of at least one badly executed flowered circle, probably repeated; the rest is missing. Pierced keel handle.
SF 12128, M, u/s.

Multi-nozzle (Fig 7.5)

Round

7.153* The shoulder consists of an indeterminate design, then ridge, triangular beading, ridge. The discus is probably plain. Beaded bar nozzle.
SF 15067, K 4502, levelling for construction of small basilica, 450–600.

7.154* Small fragment. The shoulder consists of double circle and beaded bar nozzles outside ridge, split-rail and ridge; the discus is plain.
SF 2591, B 280, fill of Roman ditch cutting the road, 250–350.

7.155* Shoulder consists of circle and double bar nozzles, and three ridges. Discus is probably plain.
SF 14479, F 3045, fill of robber-trench, 1750+.

Irregular

7.156* Fragment of a long bodied lamp.
SF 14555, K 4405, topsoil, 1750+.

7.157 Small fragment similar to 156 above.
SF 2520, D 562, clay floor surface, 350–450.

Erotica

7.158 Indeterminate design.
SF 14598, K 4436, demolition rubble, 1750+.

7.159 Small fragment with indeterminate scene.
SF 15036, S 5252, robber-trench fill, 1750+.

Hanging lamps (Fig 7.5)

7.160* Handle and part of the body.
SF 14572, K 4405, topsoil, 1750+.

7.161 Identical piece to 7.160.
SF 4282, D 453, soil build-up, 1750+.

Handles (Fig 7.5)

7.162* Large fluted keel loop handle.
SF 14950, C 4126, pit-fill, 175–300.

7.163* Large fluted knob handle.
SF 14025, D 434, topsoil, 1750+.

7.164* Fluted keel knob handle.
SF 1081, D 402, destruction level, 1750 +.

7.165* Composite handle.
SF 14940, D 600, pit-fill, 400–450.

7.166* Impressed ‘phrygian hat’ handle.
SF 4725, D 672, pit-fill, 200–300.

7.167* Large loop handle with indeterminate design.
SF 14564, K 4431, robber-trench fill, 1750+.

7.168 Fluted keel knob handle. (cf, 7.164).
SF 14572, K 4405, topsoil, 1750+.

7.169 Fluted keel knob handle. (cf, 7.164).
SF 14955, K 4405, topsoil, 1750+.

Bases (Fig 7.5)

7.170* Triple ring base with ridges.
SF 15041, M 4835, pit-fill, 450–600.

IMPORTED LAMPS

PEAR-SHAPED LAMPS (Figs 7.5 and 7.6)

7.171* The shoulder consists of dots and radial lines outside a channel, with more dot and line decoration around the filler-hole. Buff fabric with thin red slip.
SF 5049, A 2015, collapsed earth and stone wall, 450–600.

7.172* Similar to 7.171.
SF 14682, P 5051, destruction material from the late Roman city used as make-up in the construction of the early Byzantine tower, *c* 450.

7.173 Small fragment showing part of nozzle.
SF 7050, F 3011, demolition level, 1750+.

7.174* Fragment of large lamp showing herring-bone decoration on the shoulder. Buff fabric with orange-brown slip.
SF 1225, D 421, rubble, 1750+.

7.175 Nozzle fragment (burnt), of similar type to 174.
SF 4292, D 451, tumble of stones probably from a wall outside the area, 1750+.

FACTORY LAMPS (Fig 7.6)

Ordinary

7.176* Orange fabric and brown slip.
SF 6628, C 4118, pit-fill, 100–175.

7.177 See 7.176.
SF 4278, D 489, pit-fill, 1750+.

7.178* Buff fabric and light brown slip.
SF 15042, C 5306, burnt dump, backfilling defensive ditch 3, 250–350.

7.179 Small part of top similar to 7.78. Red slip.
SF 5950, A 2023, make-up for the berm, *c* 450.

7.180 See 7.178.
SF 14591, C 4033, backfill of ditch, 450–500.

7.181 Small fragment showing part of rectangular knob (cf, 7.178).
SF 14331, P 5020, cultivation soil, 250–350.

7.182 See 7.176.
SF 14548, D 686, cobbled surface, 200–300.

7.183 See 7.178.
SF 14543, A 2188, primary fill of destruction material in defensive ditch 2, 450–500.

Base

7.184* Stamped base. buff fabric with a thin orange brown slip.
SF 14074, A 2135, backfill of late Roman ditch, 450–600.

Light fabric and extended nozzle

7.185* Ribbon style knobs on the shoulder and pierced knob handle. Buff fabric with a thin orange slip.
SF 5306, A 2277, primary pit-fill, 100–130.

7.186 See 7.185.
SF 4727, D 699, fill of a very early pit, cut soon after tree-clearance, 130–150.

7.187 See 7.185.
SF 4727, D 699, fill of a very early pit, cut soon after tree-clearance, 130–150.

7.188 SF 5295, A 2259, pit-fill, 100–175 (cf, 7.185).

7.189 SF 2695, B 319, pit-fill, 100–130. Handle (cf, 7.185). The context is dated 130–150.

CURVING TOPS (Fig 7.6)

This group is characterised by its curving upper piece, forming either a convex, or concave top. There is no break between shoulder and discus.

No ridges. thin-walled

Central filler-hole

7.190* Circular lamp with large rosette around filler-hole. Buff fabric with red slip.
SF 15093, u/s.

7.191* Very thin-walled lamp with radial line decoration around the filler-hole. Buff fabric and red slip.
SF 2597, B 292, pit-fill, 300–450.

7.192 Part of nozzle and top. Buff fabric and thin red slip.
SF 5295, A 2259, pit-fill, 100–175.

7.193 (cf, 7.190 above).
SF 14557, A 2157, backfill of defensive ditch, 450–500.

7.194 (cf, 7.190).
SF 14591, C 4033, backfill of ditch, 450–500.

Off-centre filler hole

7.195* Stylised herring-bone decoration towards the outside, plain discus. Pierced knob handle. Buff fabric, thin red slip.
SF 4722, D 677, fill of Roman ditch, 175–250.

Unknown filler hole

7.196 Small fragment of body and pierced handle (cf, 7.195).
SF 3166, E 1024, occupation level, 450–600.

7.197 Small fragment (cf, 7.195).
SF 15002, C 5309, fill of cut for propugnaculum, 300–400.

7.198 Small fragment of body. Buff fabric with dark brown slip.
SF 15008, C 5312, backfilling of ditch, 250–350.

7.199 (cf, 7.195). Dark brown slip.
SF 14462, K 4402, demolition debris, 1750+.

Base

7.200* Base with rings and radial impressions. No slip.
SF 14543, A 2188, primary fill of destruction material in defensive ditch 2, *c* 450.

Others

7.201* Thick-walled type with indeterminate knob design. Pierced keel handle. Orange fabric with red slip.
SF 1229, A 2017, berm of the Roman defences, 450.

7.202 See 7.201.
SF 14468, K 4405, topsoil, 1750+.

7.203 Small fragment showing radial ribs.
SF 14993, P 5051, destruction material from the late Roman city used as make-up in the construction of the early Byzantine tower, *c* 450.

7.204* Triple circle decoration on the outer part and a plain discus. Bent over loop handle. Red fabric with brown slip.
SF 4291, D 451, tumble of stones probably from a wall outside the area, 1750+.

MISCELLANEOUS (Fig 7.6)

Sandy fabric

7.205* There is no shoulder/discus boarder; radial lines around filler-hole. Small knob handle. Red slip.
SF 14934, D 584, pit-fill, 400–450.

7.206* Radial lines on shoulder, plain discus. Pierced knob handle. Red slip.
SF 14936, C 4095, floor surface, date uncertain.

7.207* Figure of eight pattern on the shoulder, indeterminate pattern on the discus. Orange fabric with brown slip.
SF 8179, F 3258, demolition level, 1750+.

7.208 Small fragment. Simple radial and concentric incised lines.
SF 15039, R 5218, make-up level using material from destruction level covering the Roman city, *c* 450.

7.209 SF 4362, D 558, destruction deposit within the 'early building', 350–450.

7.210 Small fragment showing radial lines.
SF 14981, P 5051, destruction material from the late Roman city used as make-up in the construction of the early Byzantine tower, *c* 450.

7.211 Part of a ring base.
SF 14984, A 2251, collapsed remains of a hearth, 450–600.

7.212 Part of a ring base.
SF 15037, M 4848, pit-fill, 350–450.

7.213 Part of a ring base.
SF 14595, E 1072, dump filling robbed drain, 450–600.

7.214 Part of a flat base.
SF 14563, D 682, pit-fill, 400–500.

Thin buff ware – brown slip

7.215 Part of an extended nozzle.
SF 5100, A 2021, remains of proteichisma, 450.

7.216 Part of an extended nozzle.
SF 6635. C 4118, pit-fill, 100–175.

7.217* Two pieces, almost certainly from the same lamp. Plain shoulder and discus.
SF 14986, A 2277, primary pit-fill, 100–130.

7.218 Part of an extended nozzle.
SF 15007, C 5309, fill of cut for propugnaculum, 300–400.

7.219 Part of an extended nozzle.
SF 6635, C 4118, pit-fill, 100–175.

7.220 Part of an extended nozzle.

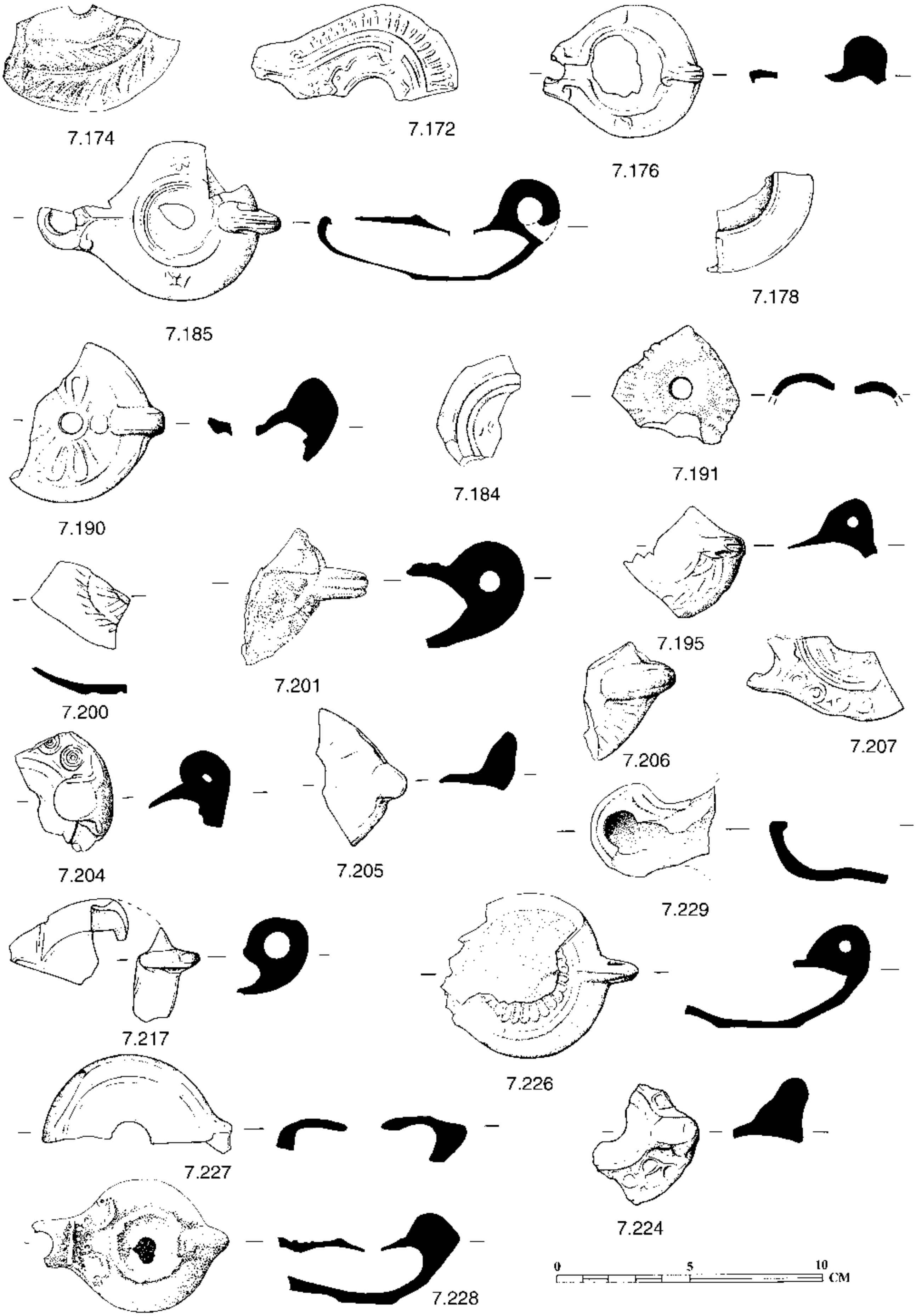


Fig 7.6 Imported Lamps

SF 14024, A 2023, make-up for the berm, *c* 450.

7.221 Base fragment.
SF 14478, C 4118, pit-fill, 100–175.

7.222 Small fragment.
SF 14478, C 4118, pit-fill, 100–175.

'Worn' ware

This ware has a very thin brown patchy slip that gives it a worn appearance.

7.223 Small fragment showing dot decoration on the shoulder.
SF 15027, F 3361, accumulation of dissolved mudbrick, 400–450.

7.224* Abstract design on the shoulder. Knob handle.
SF 4479, D 537, silty build-up and dump material, 350–450.

7.225 Fragment with dot decoration on the shoulder.
SF 13520, S 5263, make-up for floor within the gate chamber, 450–600.

Others

7.226* Circular lamp with plain shoulder and neatly executed rosette around filler-hole. Pierced knob handle. Buff fabric with thin red slip.
SF 6629, C 4118, pit-fill, 100–175.

7.227* Circular lamp with no decoration. It is possible that the nozzle is off-centre. Buff fabric with thin brown slip.
SF 15040, F 3132, grubenhaus floor, 800–1000.

7.228* Plain shoulder and discus, but elaborate nozzle decoration. Knob handle. Buff fabric with thin brown slip.
SF 6001, C 31, rubble layer, 1750+.

7.229* Part of a wide nozzle, Buff fabric with orange slip.
SF 5249, A 2218, primary collapse/backfill in defensive ditch, 450–500.

7.230 See 7.227.
SF 15062, E 1036, occupation surface, 450–600.

8

SCULPTURE AND ARCHITECTURAL DECORATION

by

Tom Blagg†

A total of one hundred and fifty-five items of sculpture and carved architectural stonework is included in the following catalogue. Most of them were in a fragmentary condition, and it is probable that many of them were originally made for use within the Roman city and were later reused in the early Byzantine site. Consequently, context descriptions and context dates are of no relevance to this class of finds and are not included, except where finds have been found *in situ*, reused in later structures or, rarely, where they were found in their primary location. Two items of sculpture may have continued to serve their original function. Seven pieces of a hemispherical basin, 8.1, decorated externally with a vine scroll were found in the rubble spread, used to repair the road surface in area C. The pedestal, 8.3, from area D may also have been used as a support rather than re-used as a building stone. The other items are all very fragmentary and little can be deduced from them. One notable find, 8.4, was carved in relief with what appears to be Athena's aegis, and was reused in the foundations of the early Byzantine building in area M.

Remains of columns were the most numerous amongst the architectural stonework, accounting for just over half of the finds. Most of the column capital fragments were of the Ionic order. Only one, 8.14, was complete and it was for a column of the largest size attested in this group, with a shaft 0.542m in diameter. The size would suit a street portico or large peristyle house, but not necessarily that of the house in area M where it was found. Where the diameters of the remainder could be calculated, they ranged between 0.240 and 0.350m, and the other fragments were commensurate, a size appropriate to the peristyle or portico of a house. Most of the fragments were of a single volute, and in cases where the foliage of the bolster survived, no two were identical, nor were any close matches found with capitals excavated in the town (eg, Ivanov and Ivanov 1994, 117, ills. 105, 106). Their presence in the early Byzantine site may be explained, however, as the result of random spoliation of a variety of sites within the Roman city.

One piece, 8.25, was distinctive, both in being carved in relief with an equal-armed cross in place of the echinus on opposite faces, and in the relatively crude carving of its foliage in comparison with the others. This was probably carved for a late Roman church within the early Byzantine fortifications, but not for a major architectural feature, since the diameter of the seating for the column was only *c* 0.300m. In addition to the 15 Ionic fragments there is one piece of a Corinthian capital's volute and five fragments of Doric or plain-moulded capitals. The predominance of Ionic reflects the Hellenic architectural tradition of Nicopolis, unlike cities in the western provinces where the Ionic order was rarely used and Tuscan capitals were usual for columns of comparable size to those from the excavations at Nicopolis.

No complete column shafts were found. Apart from one fragment of a fluted shaft and one of a fluted pilaster, all were plain, eight of them carved with the astragal moulding from the top of a shaft and seven coming from the foot of a column. There is a wide range of sizes. Half of the shafts were between 0.225 and 0.350m in diameter, similar in dimension to the Ionic capitals with the exception of 8.14, and the rest had diameters between 0.350 and 0.500m.

Most of the bases found were also for columns of more than 0.350m in diameter. This discrepancy in size between most of the capital fragments and the bases, as well as their diversity, might be taken to indicate that there was little systematic use of the columnar structures in the early Byzantine city. Some of the column bases, 8.75–8.78, were carved with a chamfered moulding in place of the conventional half-round lower torus, a stylistic feature seen on some of the bases on the *decumanus* bordering the southern side of the agora. Their dimensions differed, however, so they probably came from several different buildings.

Only five ornamental mouldings were found, and only one of these, 8.87, was of a size to have come from a monumental building. It was found built into the south face of the Roman gate in area C, together with a large architrave block, 8.92. Another architrave combined on the same block with an undecorated frieze, 8.91, and originally from a building of smaller proportions, was re-used in the south-eastern gate in area E. A large cornice, 8.93, comparable in size with that of the 'Thermoperipatos' building south-east of the agora, was found lying on the ground surface near the north-eastern corner of the site. All the other mouldings are relatively small and simple in profile. Some of them may have formed cornices and string courses for buildings within the early Byzantine site, or part of stelae or pedestals, but others show indications of re-use as building materials. Similarities in tooling on 8.94–8.96 and 8.109–8.110 may indicate products of the same workshop or mason.

A number of small mouldings and pieces of wall and floor veneers in white and coloured marble was found. Only those with at least one worked edge in addition to a flat surface have been included here for publication. The quantities are too small and the contexts of the finds too diverse to suggest convincingly that any buildings in the early Byzantine city were decorated in marble.

The final miscellaneous category does contain a variety of material which may well have been used for structural or other purposes within the early Byzantine site, such as the channelled blocks from area C (8.145–8.149), mortars (8.152 and 8.153) and querns (8.154 and 8.155). Generally, however, the prevailing impression from the material as a whole is that of bricolage, a residue of items collected most probably at different times and from different sites within the Roman city, for a variety of purposes which cannot now be reconstructed in detail.

The following catalogue is divided into the following categories;

- Sculpture
- Columns and Pilasters
    - Capitals – Ionic, Plain
    - Shafts
    - Bases
- Mouldings
    - Ornamental
    - Plain
- Marble flooring and wall-veneer
- Miscellaneous

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RELIEF SCULPTURE (Figs 8.1–8.8)

8.1* Fragments of a bowl decorated with a vinescroll (Figs 8.1–8.2)

None of the fragments joins with another; d, e, f and g are linked by the common elements in their decoration with vine branches and bunches of grapes, and the other pieces have a similar curvature and thickness and were found in the same contexts. It therefore seems probable that they all formed part of the same vessel. Enough fragments remain to give a broad idea of the scheme of decoration, though not a detailed reconstruction.

They appear to be part of a hemispherical bowl with an inner diameter of approximately 0.80 m. Fragments a and b were part of the rim, and the decoration on g shows that it came from the lower part of the vessel, indicating that its thickness increased from 50mm. at the top to 70mm. towards the bottom. The decoration is carved in a simple manner. At the bottom, two vine stems

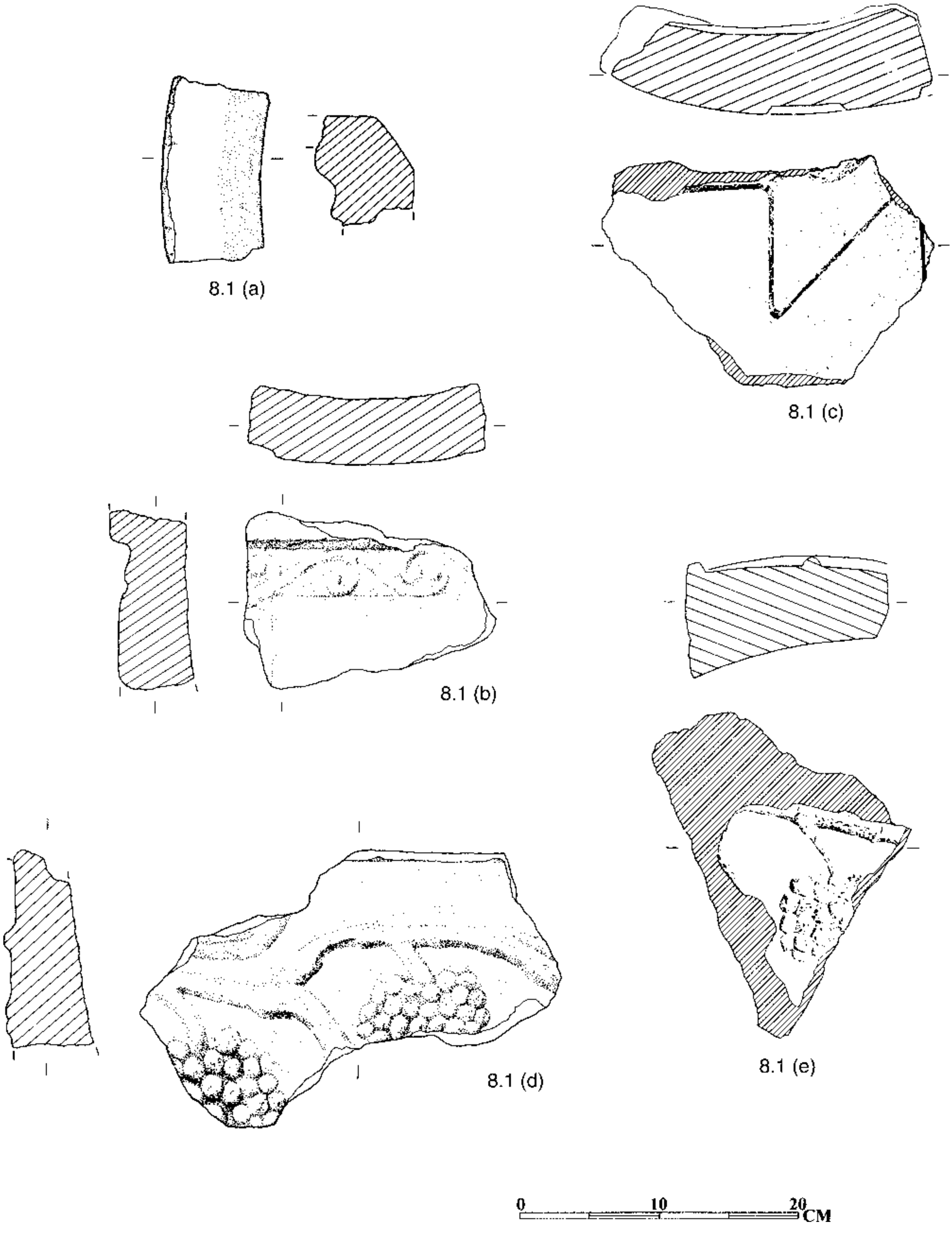
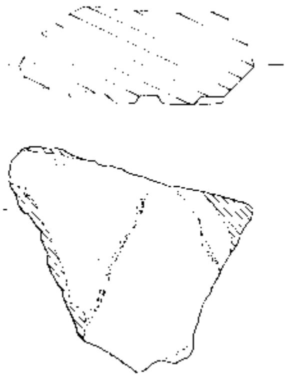
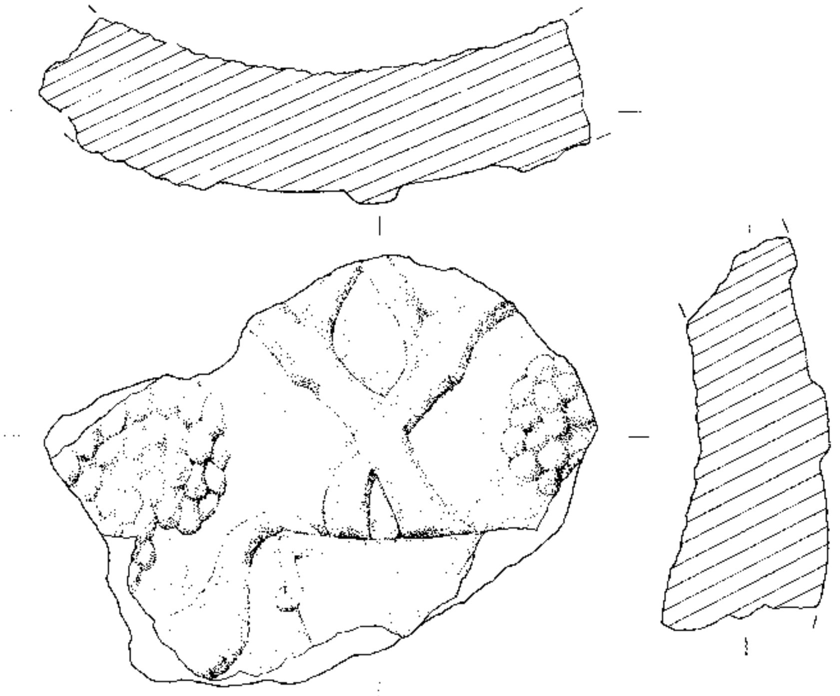


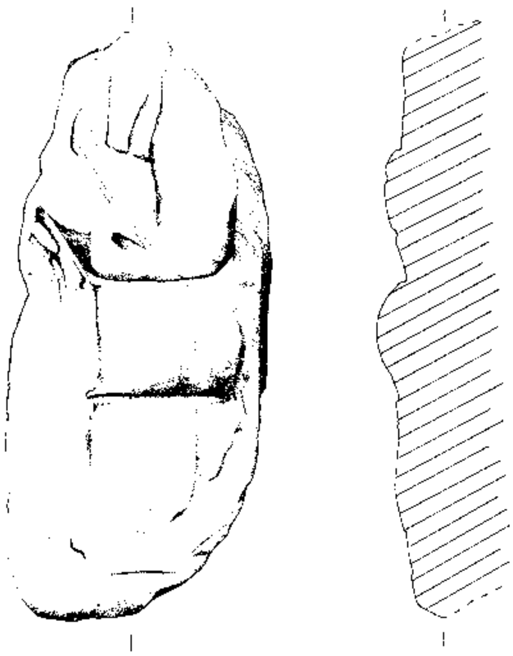
Fig 8.1 Relief Sculpture



8.1 (f)



8.1 (g)



8.2

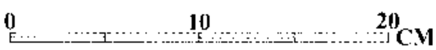


Fig 8.2 Relief Sculpture

rise from a cantharus, which has a rudimentary scrolled handle remaining on the left, and a swag or garland hanging down from it.

Clusters of grapes hang from the branches, but there are no leaves. The branches spread horizontally below the rim, the position of which is indicated by a band of flat chisel-marks at the top of d. The branches appear to have ended in scrolled tendrils above a raised panel on b. The rim had a flange and a cyma moulding on the outside, and was bevelled on the inside. Geometric panelling formed some part of the decorative scheme (on c) but not enough survives to show how this related to the rest of the design. The bowl could have been a *labarum* from the baths, or part of an ornamental fountain.

Limestone

		Height	*Width*	*Thickness*
a.	SF 6248	80	145	70–50
b.	SF 6159	120	175	52–51
c.	SF 6192	220	180	52–58
d.	SF 6168	205	305	37–60
e.	SF 6191	200	190	60
f.	SF 6306	100	125	45
g.	SF 6143	220	290	53–70

C 129 (b, e), C 130 (the remainder): rubble above road surface.

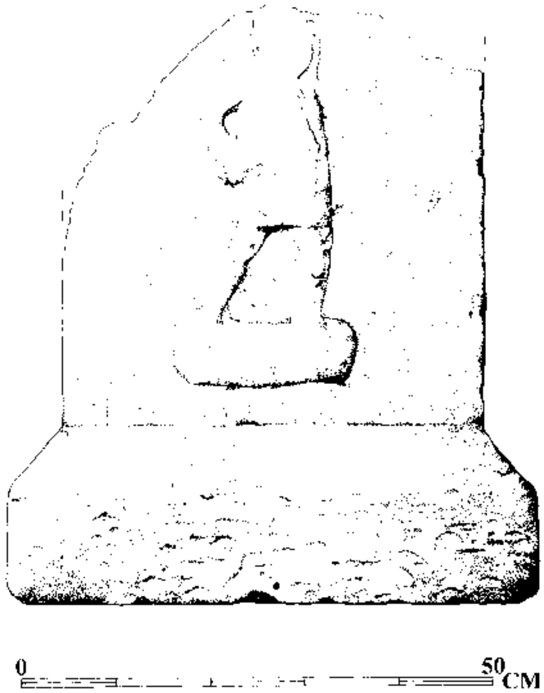
8.2* Relief of reclining figure (Figs 8.2 and 8.3)
The stone is broken all round except on the right hand side, where a smoothly dressed curved surface defines what appears to be the leg of a couch. The leg has a scrolled foot, and a lightly incised line round its border. The seat is outlined by deeply drilled horizontal channels, its upholstery indicated by lightly chiselled facets. The drapery of the figure on the couch is marked by deeply cut channels, some of them drilled, and appears to represent the left elbow and forearm, and the folds of a long robe hanging down from the seat of the couch. The piece was probably part of a funerary stele showing the dead person reclining on a couch. The form of the latter resembles similar reliefs from Varna (eg, *IGBulg* I, 165–186).
The combination of chiselling and deep drilling indicates a 2nd century AD date.
White marble. Height 310mm, width 130mm, thickness 260mm.
SF 1215, D 420.

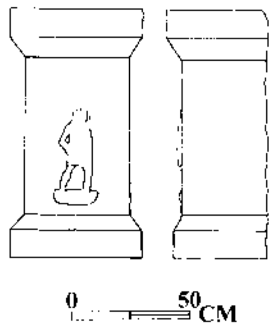
8.3* Statue pedestal? (Figs 8.3 and 8.5)
The rectangular shaft is 665mm. high, decorated on the front with a standing figure in low relief. The base and capital of the pedestal are chamfered on the front and both sides. The top third of the block had been broken into a number of fragments, some of which are missing. The top, which is dressed quite roughly with a punch, measured 540mm wide × 410mm. The back has been roughed out to a vertical surface. The front and sides were dressed with a punch, but to a smoother finish than the top. The figure, with the rectangular ground on which it stands, is 390mm high. It is much weathered, and the head is defaced. It is half turned to the figure's left, the right leg extended. The lower edge of the tunic is carved above the knee, but otherwise there is no indication of dress. The right arm is bent, with the hand by the hip, holding the butt end of a shaft pointing slightly upwards across the body. The left side of the body is carved as a smooth curve, as if the left arm were concealed behind a shield. It might thus represent a soldier, with the shaft of the right hand being that of a sword but the weathered state of the figure prevents certainty. There is no inscription.



Fig 8.3 Relief of reclining Figure

However, there is reason to offer a more positive interpretation of this sculpture. The vertical side





8.3

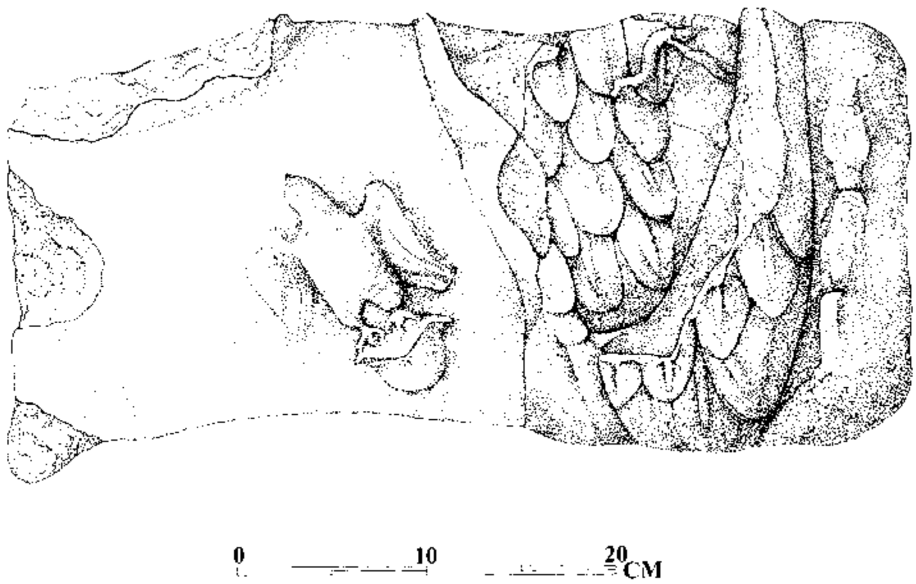


Fig 8.4 Relief Sculpture

of a shield is visible in front of the figure and, in the middle, a domed *umbo.* The left leg is flexed and disproportionately thicker than the right leg, probably because it was protected by a greave. The head, though damaged, is larger than the proportions of the body would allow which can best be explained if the figure is wearing a large helmet. It is difficult to see what the 'shaft', grasped in the right hand, could be other than a sword. Both the stance and the armour suggest that the figure is a gladiator. Similar depictions of gladiators, also on stone bases, are common finds and this example can be paralleled by finds from Ephesus (Robert 1940, no. 215, plate X, Grossschmidt *et al* 2002, 78–82). The absence of an inscription and any sign of a setting on top of the stone for a statue – equally true for four of the bases from Ephesus – imply that the stone was neither a funerary monument nor a statue-base. At Ephesus, they are interpreted as architectural elements which had



Fig 8.5 Statue Pedestal?

been used to decorate a structure associated with gladiatorial combat (Grossschmidt *et al* 2002, 775). Two similar pillars with depictions of gladiators (also without inscriptions) have been found on the site of the neighbouring city of Augusta Traiana (Stara Zagora). Each of these bases have rectangular cuts in two of their plain sides, probably used for the insertion of wooden horizontal beams to support barriers surrounding a temporary arena just inside the city's west gate where these stones were found and where a paved piatza is flanked on one and probably two sides by marble seating (pers comm. K. Kolchev, Stara Zagora Museum). Though this base at Nicopolis lacks the slots in the sides, it seems likely that, whether functional or decorative, the monument was connected with gladiatorial games (cf, IGBulg II 660) which are known to have taken place in the Roman city (A.G. Poulter).
Limestone.
SF 4107, SF 4171, D 451.

8.4* Relief with aegis and eagle (Figs 8.4 and 8.6)
The left half of the stone is lightly convex, and is carved in low relief with an eagle 130mm high, standing with wings displayed, looking to its right. It is perched on a convex feature. Separated from it by a convex-profiled ridge in high relief, the right half of the stone is carved with overlapping feathers or pteruges, arranged in two curved swathes, suggesting drapery. At the top are two crossing sinuous bands. These may be interpreted as the tails of the snakes knotted beneath Medusa's chin, the pteruges thus forming Athena's aegis. The eagle may be a feature on her breastplate, the stone having formed part of a statue or relief carving.
White marble. Height 230mm, width 485mm.
SF 12464, M 4807, *in situ*, built into the wall foundation of the early Byzantine building.

8.5* Arm of statuette
The left elbow and forearm of a muscular figure which would originally have been *c* 0.5 m high, ie, about one-third life-size. A broken surface along the inner arm shows that it was carved in one piece with the side of the body. Possibly it came from a figure of Hercules, leaning with his left hand on his club.
White marble. Length 77mm, thickness 38mm.
SF 1173, D 401.

8.6* Arm of statuette
The elbow of the bare right arm of a figurine approximately 0.3 m high.
White marble. Length 38mm, thickness 17mm.
SF 3225, E 1088.

8.7* Hand of statuette
Human left hand holding part of a tapering shaft. The scale is about one-third life-size. The hand is bent back at the wrist. The thumb and the third and fourth fingers hold the shaft. The first two fingers are broken, but were formerly extended along the shaft. The thumb is carved in more detail than the small fingers, and the stone is more polished on that side, suggesting that the hand was intended to be viewed from that aspect. There is a raised band around the wrist, too broad for a bracelet, so presumably the cuff of a sleeved garment. The shaft is squarish in section, with slightly curved sides.
White marble. 55 × 51 × 42mm.
SF 6562, C, u/s.

8.8* Fragment of a statue, with perforation
The piece is roughly square in section, with the sides modelled to concave smoothly polished surfaces. It seems more like part of an animal's or a bird's body than the section of a limb, but the piece is too fragmentary to tell for sure. It has a cylindrical perforation 22mm in diameter, with an incised channel leading to it from the edge of the broken surface, possibly indicating suspension as a weight.

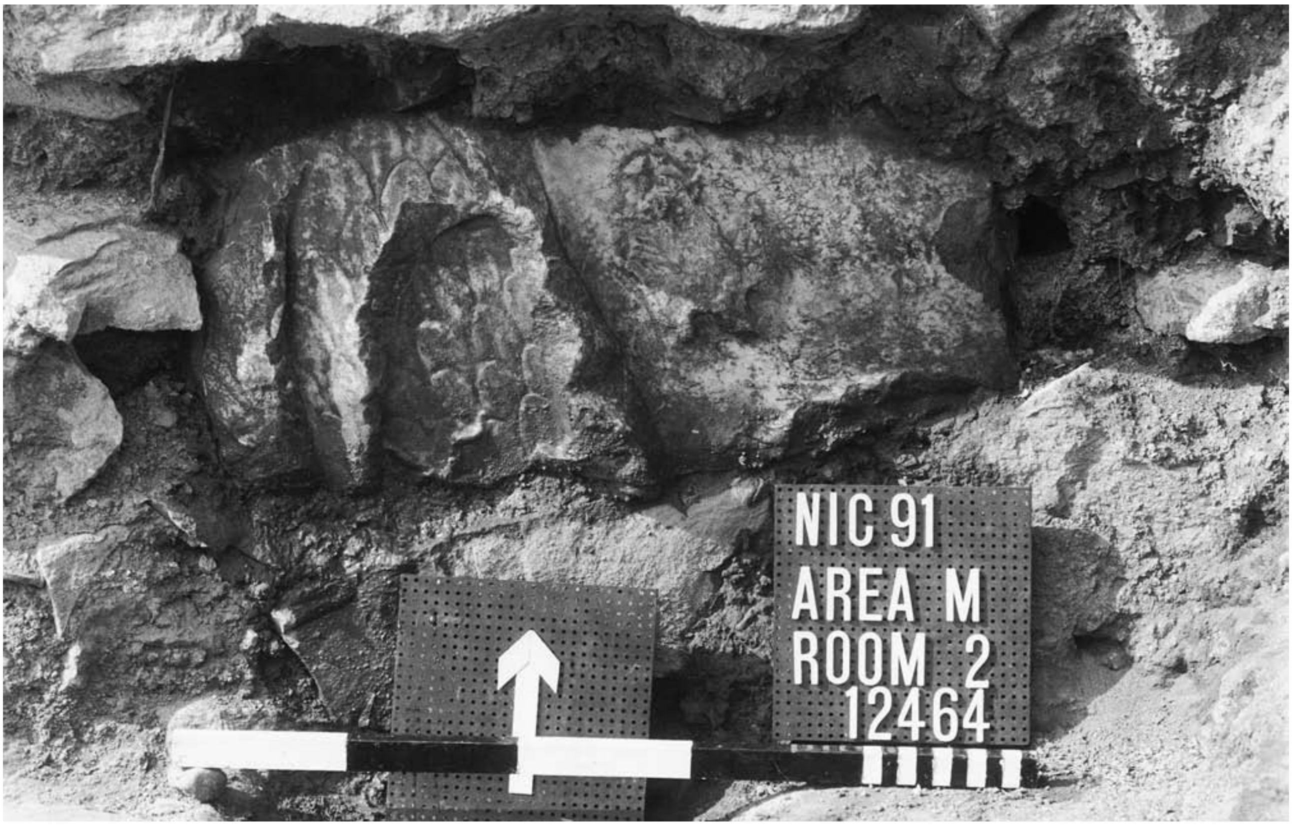


Fig 8.6 Relief with Aegis and Eagle

Limestone. Height 145mm, 90 × 90mm.
SF 12194, M 4883.

8.9* Fragment of drapery
The fragment has mortar adhering to its carved face, indicating re-use as building material. It is deeply carved in relief with folds of drapery, the grooves between them cut with an obliquely-held drill. The technique would indicate a date after the mid-second century AD. The effect of the flowing folds suggests that the figure was represented in motion. The back of the stone is chiselled flat from below, using a blade 8mm wide.
White marble. Height 140mm, width 150mm, thickness 70mm.
SF 14089, P 5005.

8.10* Fragment of drapery or foliage
The fragment is carved with a slightly splayed group of ribs, those in the middle being broader and more rounded in section, the others cut narrower and more angular. It may come from the central section of an acanthus leaf, or from a rather stylised rendering of drapery folds.
Marble. Height 54mm, width 58mm, thickness 25mm.
SF 14349, P 5029.

8.11 Fragment of foliage
The fragment is carved with two curving concave mouldings with indented tapering flat surfaces between them. It could be part of the foliage and volute of a Corinthian capital.
White marble. Height 135mm, width 60mm, depth 60mm.
SF 14354, P 5032.

8.12* Relief with tendril
The face is carved with a curved stem from which two spiral tendrils sprout. Above it is a curved slightly raised edge, possibly another stem. The bottom is dressed flat.
Limestone. Height 140mm, width 140mm, depth 170mm.
SF 8052, F, u/s.

8.13* Pilaster with cross in relief
The front and back of the stone are smoothly dressed and polished. A cross 185mm high, with expanded terminals and the lower arm longer than the rest, has been carved out of the front face with a punch. While the right side of the stone is dressed square, the front edge of the left side is bevelled, and the rest irregular, as are the top and bottom. The stone has thus been roughly cut square for secondary use. It is not certain to which period the carving of the cross belongs, but it seems quite possible that it came from one of the early Byzantine churches on the site (see introduction).
White marble. Height 345mm, width 270mm, depth 92mm.
SF 13010, R 5205.

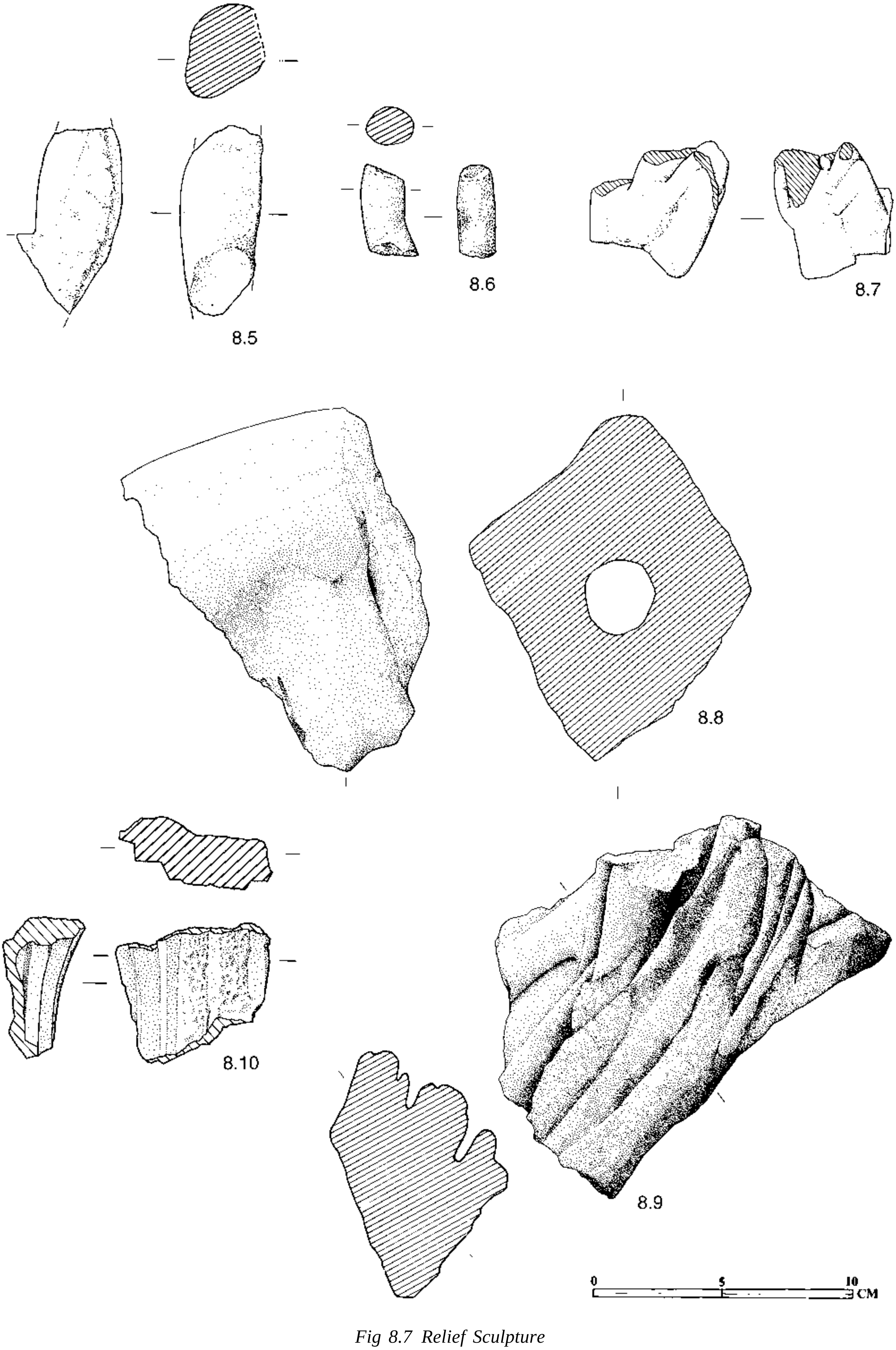


Fig 8.7 Relief Sculpture

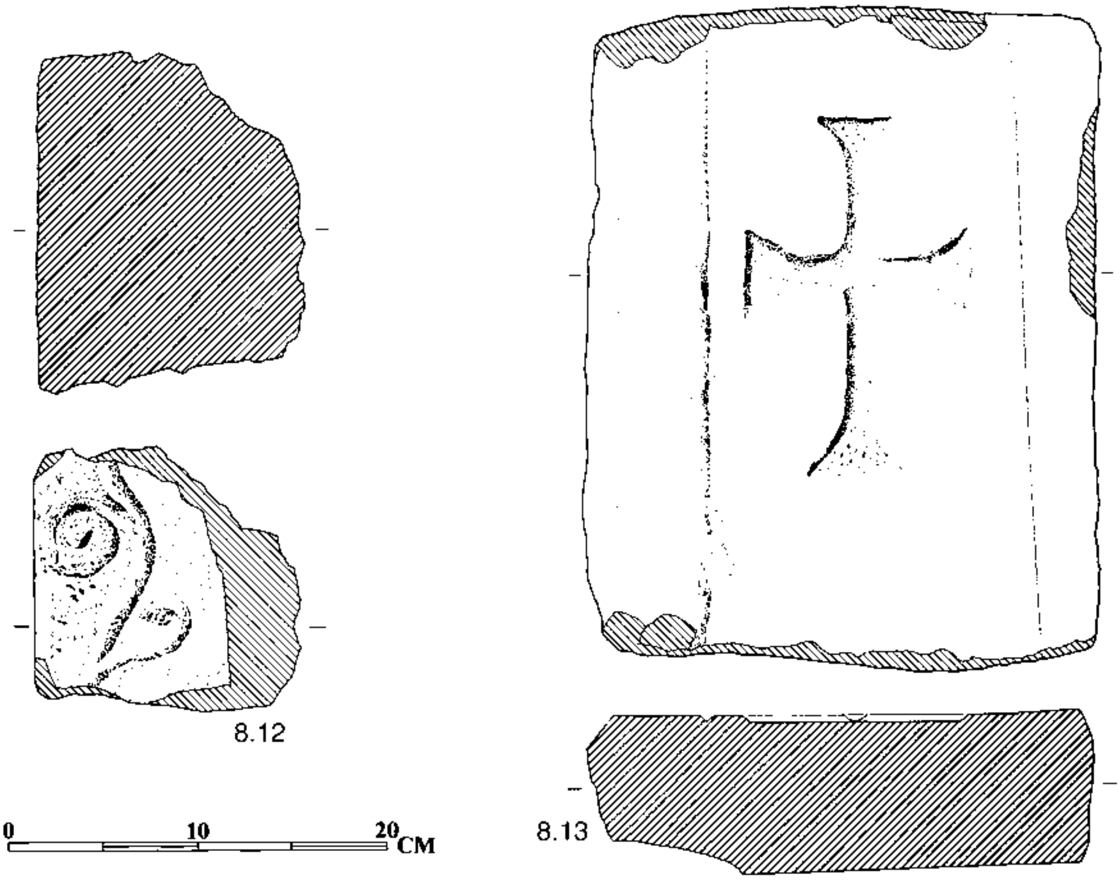


Fig 8.8 Relief Sculpture

COLUMNS

COLUMN CAPITALS (Figs 8.9–8. 12)

8 14* Ionic capital (Figs 8.9 and 8.10).
The capital is substantially complete, save for one partially broken volute and damage to the palmettes on the echinus. There is an egg-and-dart ovolo, the casing deeply cut. The carving of the serrated leaves on the bolster is flat, and defined by deeply-cut grooves, producing a sharply facetted effect. Above it, on the abacus, are two lobed palmette spirals. The diameter suggests that the capital came from a street colonnade or a large peristyle. None of the Ionic capitals now to be seen within the city has identical decoration.
Limestone. Height 305mm, width 798mm across volutes, diameter of column shaft 542mm.
SF 12004, M, u/s.

8.15* Volute of Ionic capital
Two joining fragments comprising a left hand volute and part of the bolster. The latter is carved with a spray of rather bulbous spiral-ended leaves. The rim of the seating for the shaft indicates a column of *c* 350mm in diameter.
Limestone. Height 132mm, width 215mm, depth 90mm.
SF 2216, SF 2221, B 243.

8.16* Fragment of Ionic capital
Part of the bolster of a capital, decorated in part with stopped fluting alternating with grooves, in part by a rinceau with a quatrefoil rosette. It is rather more elaborate in its detail than most other Ionic capitals from the site.
Limestone. Width 125mm, 83 × 65 in section.
SF 4008, D 405.

8.17* Fragment of Ionic capital
Central part of the bolster, with two differently-aligned sections of fluting separated by a vertical groove. Part of the seating for the column survives, indicating a shaft diameter of *c* 400mm.
Limestone. Height 60mm, width 110mm, depth 70mm.
SF 2207, B 244.

8.18* Volute of Ionic capital
Upper part of a left-hand volute, with the lower side of the palmette leaves. The bolster is decorated with a three-lobed leaf with an incised central vein. The diameter of the volute is proportionate for a column diameter of *c* 370mm.
Limestone. Height 155mm, width 160mm, depth 105mm.
SF 4400, D 573.

8.19* Volute of Ionic capital

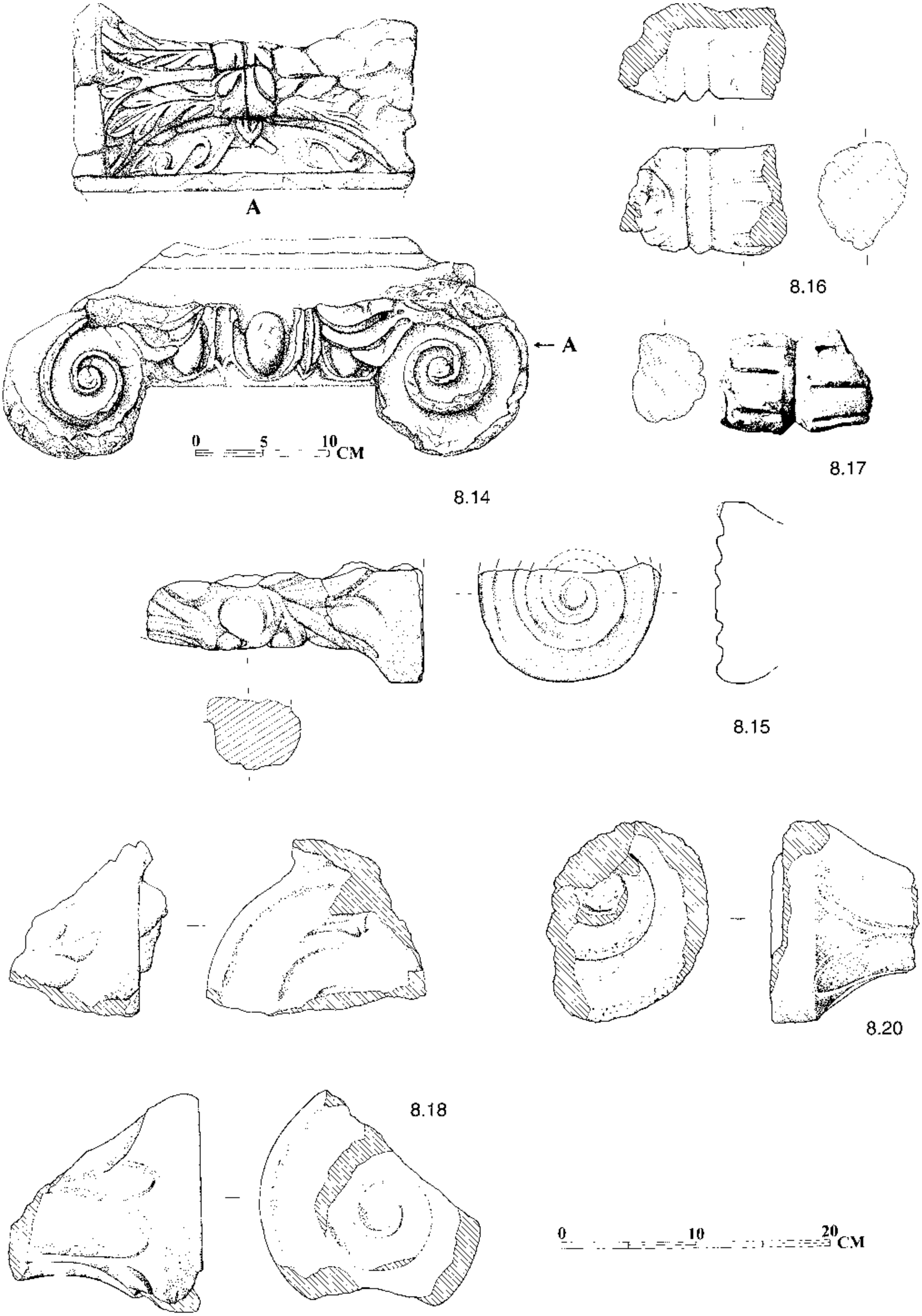


Fig 8.9 Column Capitals



Fig 8.10 Ionic Capital

Part of a left-hand volute. The bolster is carved with unserrated leaves, with the tips of a second row in the spaces between them. The leaf surfaces are carved with a fine-toothed claw chisel.
Limestone. Height 176mm, width 145mm.
SF 14007, C, u/s.

8.20* Volute of Ionic capital
Part of a left-hand volute. The bolster is decorated with unserrated leaves alternating with Y-shaped lotus: the carving is flat and lacking in detail. Surface encrustation.
Limestone. Height 145mm, width 105mm.
SF 12056, M 4835.

8.21* Corner of Ionic capital
A left-hand volute with the palmette spray and part of the adjacent ovolo. The bolster has simple unserrated leaves with part of a rosette or scroll.
Limestone. Height 166mm, width 200mm, depth 165mm.
SF 12426, M 4936.

8.22* Volute of Ionic capital
A small right-hand volute. The channels between the spirals are carved quite flat, not fully hollowed-out. The outer spiral has mostly been chipped away. The side is carved with slender pointed leaves.
Limestone. Height 115mm, width 80mm.
SF 8312, F 3357.

8.23* Volute of Ionic capital
A segment of a right-hand volute. A pin-hole survives in the centre of the volute from the laying-out of the spiral. The side is carved, in rather higher relief than usual, with broad unserrated leaves separated by flat channels. The leaf surfaces have the marks of a fine-toothed claw chisel. The surface is reddened from exposure to fire.
Limestone. Height – , width 165mm.
SF 6583, C 126.

8.24* Volute of Ionic capital
From a left-hand volute, the lower edge missing. The side is carved with broad lanceolate leaves defined by V-shaped incised grooves, and a small surviving section of horizontal fluting. The edge of the column seating on the underside indicates a shaft diameter of *c* 240mm.
Shelly limestone. Height 142mm, width 200mm.
SF 3049, E, u/s.

8.25 Part of an Ionic capital
Slightly less than half the capital survives, broken from front to back. A plain equal-armed cross is carved next to the volute on two opposite faces, in place of the conventional echinus. The spirals of the volutes are crudely carved. The bolster at the side features two rudimentary calyces of leaves, one on each side of a central groove cut with a claw chisel. The seating for a column about 300mm in diameter is roughly cut out on the underside with a punch. The high abacus is splayed outwards and upwards at the side in the manner of the impost block on early Byzantine Corinthian capitals. That, and the degeneration of the classical motifs, suggests a fifth-century or later date. The crosses indicate that the capital came from an ecclesiastical building. It is not large enough to have belonged to the nave colonnade of the basilica in area F, though conceivably it might have come from its narthex,

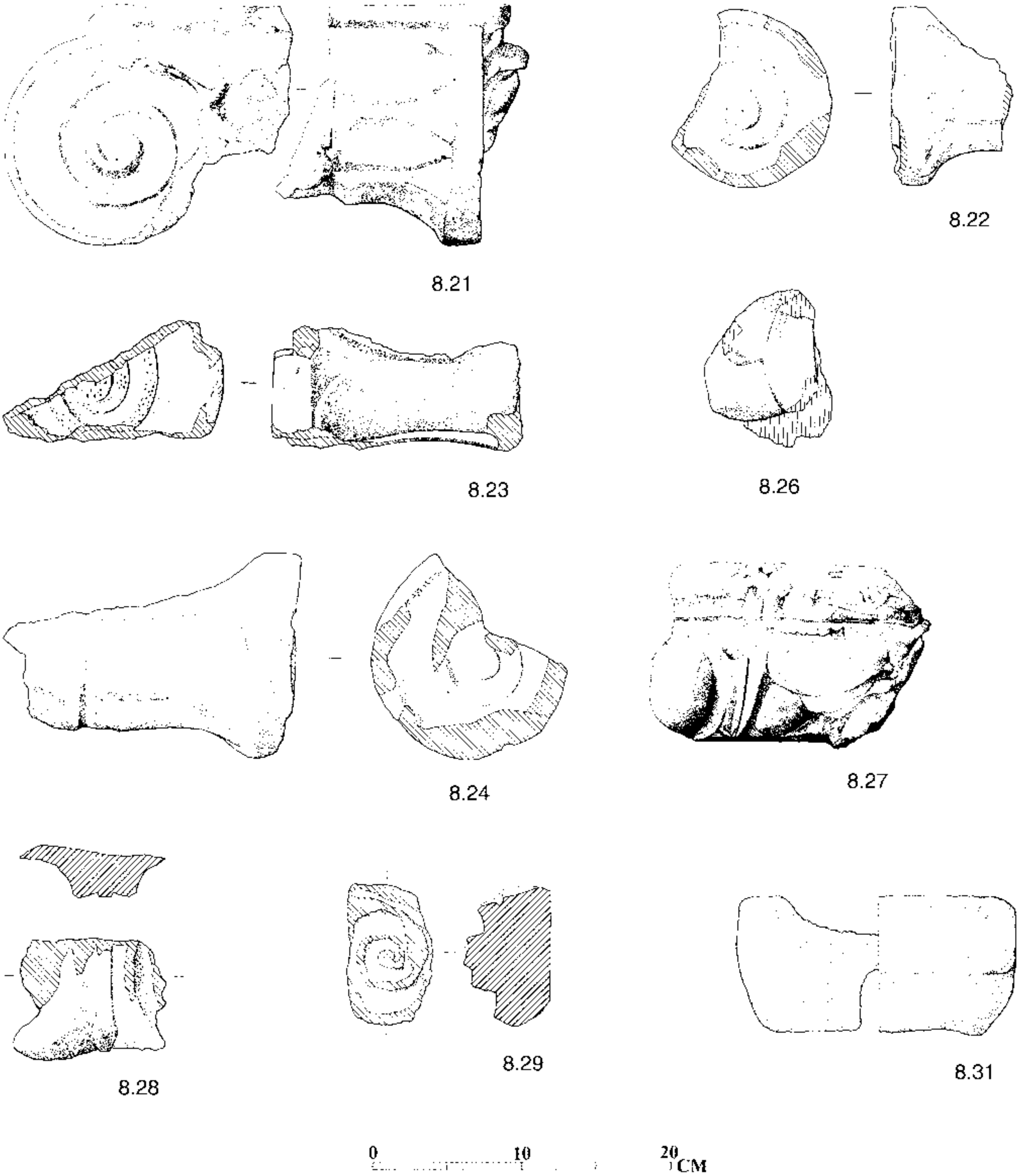


Fig 8.11 Column Capitals

or from a smaller church, perhaps that excavated in area K.
Limestone breccia. Height 200mm, width 280mm, depth 430mm.
SF 4163, D 443.

8.26* Fragment of Ionic capital
Part of the echinus adjacent to a left-hand volute, with an egg of the ovolo and parts of two strands of the palmette. These, and the upper casing of the egg, were partly undercut so as to stand free from the background, similar in that respect to the large capital numbered A 80 on site by the decumanus south of the Odeon, but unlike the slightly larger capital 8.14 above.
Marble. Height 90mm, width 120mm, depth 80mm.
SF 1082, D 414.

8.27* Fragment of Ionic capital
Right-hand part of the echinus, with the terminals of the palmette and a dart between two eggs of

the ovolo. Marks of a rasp are visible on the ovolo and the underside.
Limestone. Height 120mm, 230 × 160mm.
SF 2475, B 249.

8.28* Ovolo, probably of Ionic capital
The fragment consists of a tongue between the casing of two adjacent ovolos. While the fragment's size is insufficient for certain attribution, the proportions are appropriate for the echinus of an Ionic capital similar to those listed above.
Limestone. Height 80mm, width 100mm, depth 40mm.
SF 6526, C 4032.

8.29* Volute of Corinthian pilaster capital
The fact that the spiral is not carved on one plane, but coils outwards at the centre, shows that it was part of a Corinthian rather than an Ionic capital. The piece is cut flat at the back, so must come from a wall veneer.
White marble. Height 95mm, width 55mm, thickness 58mm.
SF 13001, N, u/s.

8.30* Doric capital
There are two joining pieces. The rings beneath the ovolo were cut with a flat chisel, with smooth bands 15mm wide above (on the underside of the ovolo moulding) and below (at the top of the shaft). Otherwise, the ovolo and shaft were cut with a claw chisel.
Limestone. Height 220mm, width 330mm, diameter of shaft *c* 400mm.
SF 4688, D 682.

8.31* Doric capital (?)
The profile consists of a vertical abacus above a quarter-round moulding. The upper surface has a saucer-shaped cavity 18mm deep, 125mm in diameter, cut with a punch. There is a cylindrical dowel-hole in the underside. It could have surmounted a miniature column, but its use may have been other than architectural.
Limestone. Height 85mm, width 185mm, diameter of shaft 140mm.
SF 7157, D 452.

8.32* Plain-moulded capital
Simply carved with a claw chisel. The junction between the abacus and the shaft is effected by a chamfer, rather than a moulding, and is not cut truly straight. The section of shaft is tapered. Two opposite corners of the abacus are broken.
Limestone. Height 148mm, width 345mm, diameter of shaft 308mm.
SF 5042, A 2022.

8.33 Neck of capital
The top is broken, the bottom dressed smooth and flat. Part of the underside of an upper moulding remains, above a necking cut with a claw chisel. The relatively unweathered toolmarks show that the piece was part of a capital, rather than used inverted as a base. It is also broken vertically, with slightly more than half surviving.
Limestone breccia. Height 185mm, diameter of shaft 450mm.
SF 4009, D 405.

8.34* Fragment of Doric capital (?)
Fire-reddened and much weathered.
Limestone. Height 210mm, width 180mm.
SF 12326, M 4927, *in situ*, reused in the foundations of an early Byzantine building.

COLUMN SHAFTS (Figs 8.12–8.13)

8.35* Shaft with astragal
The top has a slightly raised circular seating for the capital**,** 237mm in diameter. The undersides of the bead and fillet mouldings on the abacus are defined by a flat chisel 11mm wide, otherwise the shaft is dressed with a a claw chisel. The lower end is broken.
Limestone. Height 835mm, diameter below moulding 250mm.
SF 14318, P 5025.

8.36 Shaft with astragal
Lower end broken.
Limestone. Height 360mm, diameter below moulding 230mm.
SF 12330, M 4937.

8.37* Shaft with astragal
Broken at the bottom and round much of the circumference. Mouldings and shaft are tooled in a similar manner to 8.35.
Limestone. Height 185mm, diameter *c* 500mm.
SF 4124, D 440.

8.38* Shaft with astragal
Broken at the bottom, and about one quarter of the circumference removed longitudinally, perhaps to facilitate re-use: lumps of mortar adhere to the surface. The top and shaft are claw-chiselled, the fillet and its underside cut with a flat chisel.
Limestone breccia. Height 380, diameter below moulding 245mm.
SF 14509, u/s.

8.39* Shaft with astragal
Mouldings are rounded and weathered. Just over a quarter of the circumference survives, and the lower end is broken.
Limestone. Height 390, diameter below moulding *c* 310mm.
SF 4017, D 406.

8.40* Shaft with astragal
Broken at the bottom. The top is dressed with a punch, the shaft and mouldings with a claw chisel. (Poulter 1995,119, fig 45).
Limestone breccia. Height 935, diameter below moulding 225mm.
SF 4109, D 438, re-used in the north wall of the early Byzantine building.

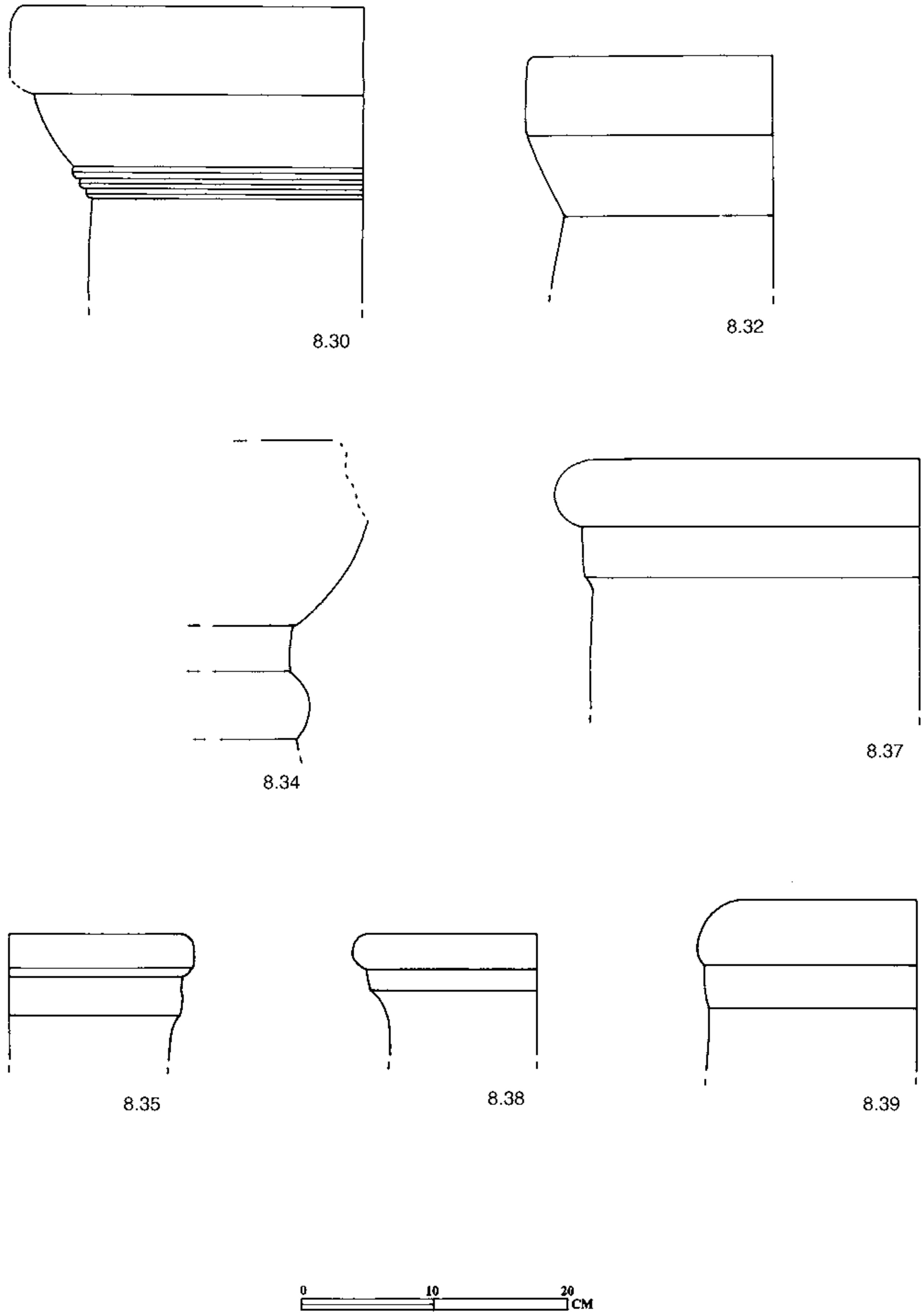


Fig 8.12 Column Capitals and Shafts

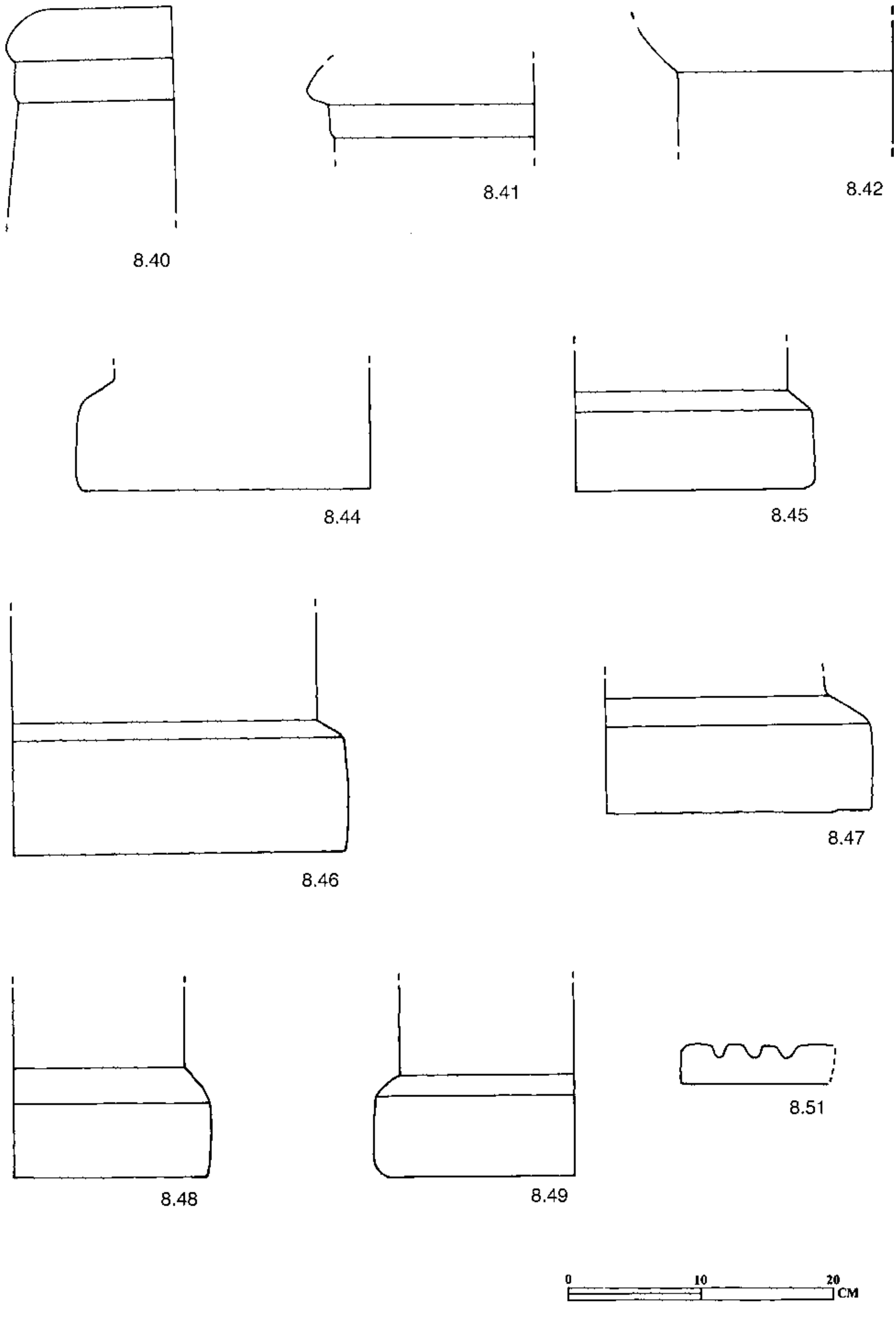


Fig 8.13 Column Shafts

8.41* Shaft with astragal
Broken at the bottom. There is a dowel hole in the top 40mm square × 52mm deep.
Limestone. Height 116mm, diameter below moulding 300mm.
SF 14401, u/s.

8.42* Shaft with moulding
The bottom is flat, the top is broken irregularly. The rounded moulding with a short length of necking is more likely to be part of a capital than of a base.
Limestone. Height 100mm, diameter of shaft 320mm.
SF 12032, M, u/s.

8.43 Foot of shaft
The expansion at the bottom (apophyge) is bevelled, rather than cut as a cavetto. The surface is roughly tooled with a claw chisel.
Limestone. Height 700mm, diameter of shaft 410mm.
SF 14498, C, u/s.

8.44* Foot of shaft
The underside has a slight chiselled rebate below the projection at the base.
Limestone. Height 320mm, diameter of shaft 380mm.
SF 14523, u/s.

8.45* Foot of shaft
Two joining fragments. Surface weathered grey. White, grey and red marble breccia. Height 135mm, lower diameter 360mm.
SF 14524, u/s.

8.46* Foot of shaft
Limestone. Height 185mm, lower diameter *c* 500mm.
SF 14525, u/s.

8.47* Foot of shaft
The underside is cut with a slight rebate 25mm back from the basal projection. Surface is claw-chiselled.
Limestone. Height 110mm, lower diameter *c* 400mm.
SF 4718, D, u/s.

8.48* Shaft
Fallen column. The shaft is dressed with a claw chisel, the chamfer of the projection roughed out with a punch. (Poulter 1995, fig 70, 188 and plate XXIX B).
Limestone. Height 2370+mm, diameter 290mm.
SF 12455, M, corner of peristyle (*in situ*).

8.49* Foot of shaft
In two joining fragments. The shaft has been roughly tooled with a punch, then a claw chisel, leaving a lightly pitted surface.
Limestone breccia. Height 205mm, diameter 300mm.
SF 4153, D 445.

8.50 Fluted column fragment
A flake, with part of one end of a convex fluting.
Grey/white marble. Height 71mm, width 48mm.
SF 14317, P 5025.

8.51* Fluted pilaster
Broken at one end and along one edge: three flutes remain.
Grey marble. Height 155mm, width 114mm.
SF 12331, M 4919.

8.52 Shaft fragment
A segment of about one quarter of the shaft, broken at both ends.
Limestone.
Height 320mm, diameter *c* 500mm.
SF -, D 506, *in situ*, built into the wall of a late Roman building.

8.53 Shaft fragment
A flake from the curved surface of a column *c* 450–500mm in diameter.
Limestone. Dimensions 150 × 150mm.
SF 12053, M 4825.

8.54 Shaft fragment
About one quarter of the circumference, broken at both ends.
Limestone. Height 170mm, diameter 420mm.
SF 12264, M 4902.

8.55 Shaft fragment
One end is broken, the other dressed flat, but damaged. About two-thirds of the shaft surface survives, dressed with a claw chisel.
Limestone. Height 310mm, diameter 415mm.
SF 12031, M, u/s.

8.56 Shaft fragment
Fire-reddened and split.
Limestone. Height 220mm, diameter 410mm.
SF 14496, C 4101, *in situ*, built into the wall of an early Byzantine building.

8.57 Shaft fragment
Limestone. Height 280mm, diameter *c* 400mm.
SF 12262, M, *in situ,* built into the foundation of an early Byzantine building.

8.58 Shaft fragment
A piece from the bottom of a column, with a base moulding 60mm high, mostly chipped off.
Limestone. Height 220mm, diameter *c* 400mm.
SF 12261, M 4807, *in situ*, built into the same wall as 8.57.

8.59 Shaft fragment
Limestone. Height 230mm, diameter 400mm.
SF 12246, M 4902.

8.60 Shaft fragment
White marble. Height 190mm, diameter *c* 400mm.
SF 3163, E 1050.

8.61 Shaft fragment
Limestone. Height 300mm, diameter *c* 380mm.
SF 12265, M 4902.

8.62 Shaft fragment
Dressed with a claw chisel. The diameter matches those of column base 8.76 (also from Area C) and 8.75 (Area D).
Limestone. Height 225mm, diameter 370–380mm.

SF 6546, C 4035.

8.63 Shaft fragment
Limestone. Height 320mm, diameter *c* 360mm.
SF 12325, M u/s, *in situ,* built into the foundation of an early Byzantine building.

8.64 Shaft fragment
About one third of the circumference survives. Broken both ends. Dressed with a fine-toothed claw chisel.
Shelly limestone. Height 340mm, diameter 340mm.
SF 14506, u/s.

8.65 Shaft fragment
From the upper end of a column: the top is flat, and a short length of astragal moulding survives. The other end is broken, and part of the circumference has been removed on opposite sides, presumably to facilitate re-use as a building stone.
Limestone. Height 290mm, diameter 330mm.
SF 14518, C 160, *in situ,* built into the foundations of the late Roman propugaculum.

8.66 Shaft fragment
Just over one quarter of the circumference survives, broken both ends. Dressed with a punch.
Limestone breccia. Height 310mm, diameter *c* 330mm.
SF 14505, u/s.

8.67 Shaft fragment
Limestone breccia. Height 310mm, diameter 310mm.
SF 14507, D, u/s.

8.68 Shaft fragment
Limestone breccia. Height 150mm, diameter *c* 300mm.
SF 14508, D, u/s.

8.69 Shaft fragment
Limestone. Height 150mm, diameter *c* 280mm.
SF 3282, E 1070, *in situ,* built into the foundations for the early Byzantine gate.

8.70 Shaft fragments
One large and several smaller joining fragments of a shaft broken at both ends.
Shelly limestone. Height 300mm, diameter 280mm.
SF 2045, B 201.

8.71 Shaft fragment
Broken both ends.
Shelly limestone. Height 540mm, diameter 260–275mm.
SF 5308, A 2118/2123.

8.72 Shaft fragment
Wedge-shaped fragment with a weathered flaked surface.
Limestone. Height 200mm, diameter 255mm.
SF 8092, F 3088.

8.73* Column pedestal (Fig 8.14)
With seating for a shaft 330mm in diameter (but apparently supported the slightly smaller column found alongside it, see 8.48) and standing on a

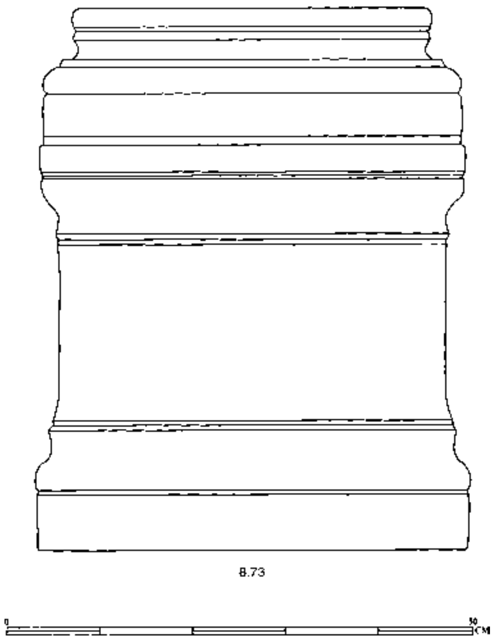


Fig 8.14 Column Pedestal

square block (SF 12453) measuring 570 × 600mm. Dressed with a claw chisel (Poulter 1995, fig 70, p.188 and plate XXIX B).
Limestone. Height 580mm, diameter 380 (top), 450 (moulding)mm.
SF 12454, M, *in situ*.

COLUMN BASES (Figs 8.15–8.16)

8.74* Base
A complete base, apart from one corner of the plinth and part of the adjoining lower torus. The mouldings (upper torus, scotia with fillets, lower torus) are proportioned 2:4:3 (30, 60 and 45mm) and the shaft diameter and lower torus are close to 3:4. The top and the side of the plinth are dressed with a broad claw chisel, the tori with a finer-toothed claw chisel, and the fillets and scotia with a flat chisel.
Limestone breccia. Height 220mm, diameter 380 (shaft), 500 (lower torus)mm.
SF 4213, D 451.

8.75* Base
Broken in three pieces, one just over half (SF 4161), the others just under a quarter each (4207 and unnumbered), joining to form a complete base of similar size to 8.74. There are differences in execution, however. The profile is more angular, particularly the lower torus, which instead of being half-round is cut vertically with a chamfer at the top. The top has a slightly concave circular channel to define the position of the column shaft. Some of the bases on the *decumanus*, south of the agora and propyleion, have similar profiles and circular channels

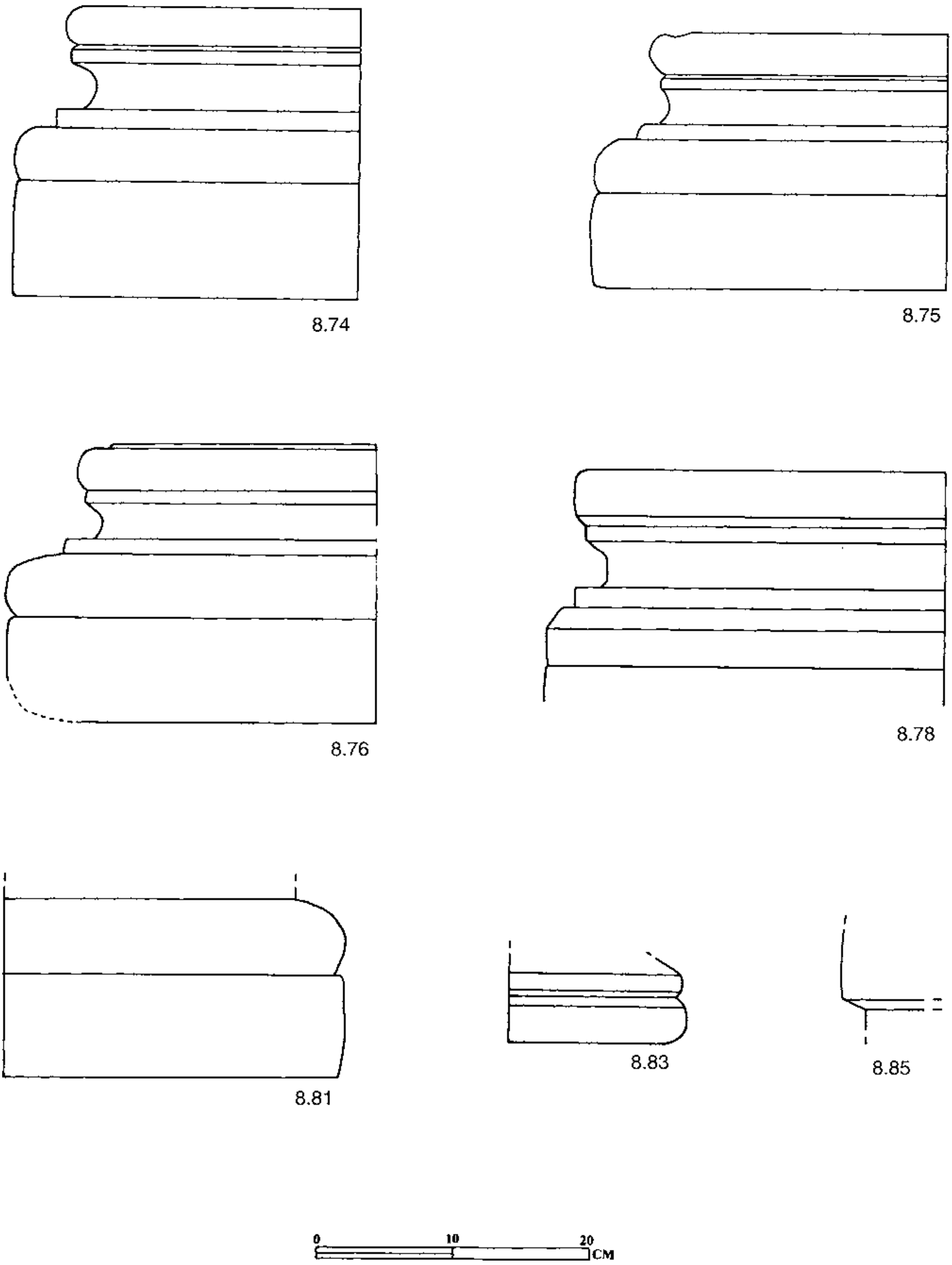


Fig 8.15 Column Bases

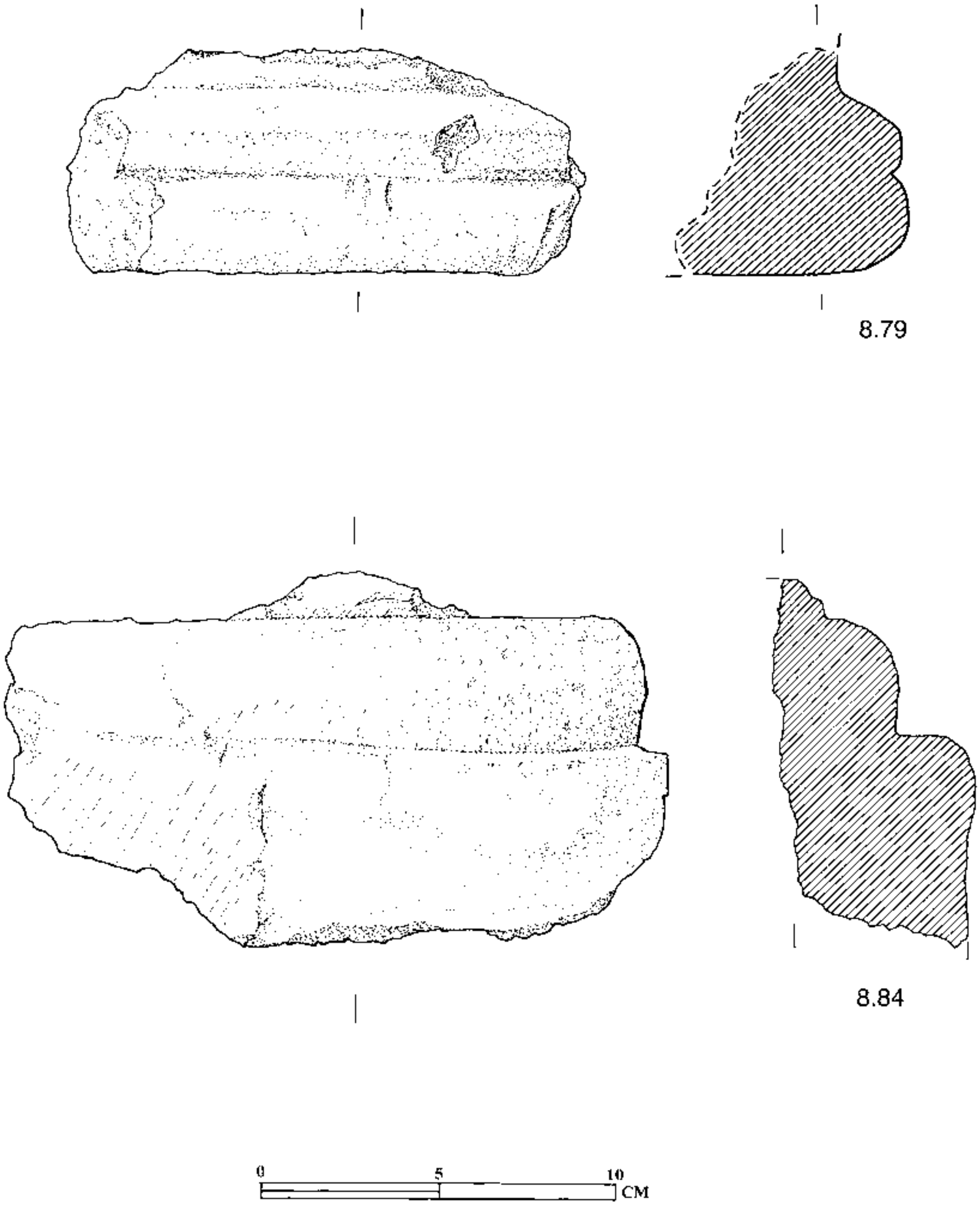


Fig 8.16 Column Bases

(which the bases with conventional Ionic profiles do not), though they are not so well executed and are rather larger than this base. The *decumanus* bases occur with conventionally-profiled bases in the same colonnades, so either they were replacements for damaged examples of the latter type, or there were two groups of craftsmen producing work to different standards. This base could, then, have come originally from the same building as the preceding item 8.74, with which part of it was found. Their column diameters are the same.

There is a cylindrical dowel hole in the top, with a V-profiled channel leading to it for the running in of lead, some of which remains at the bottom of the hole. Toolmarks of a claw chisel remain on the top and the vertical face of the torus, and of a flat chisel on the fillets and the chamfer on the torus.

Shelly limestone. Height 187mm, diameter 380mm (shaft), 510 (lower torus) mm.

SF 4161, D 445 and SF 4207, D 451.

8.76* Base fragment

The base is of the same type as 8.75, the piece comprising about one quarter of the whole. Mortar in the scotia indicates that it had been re-used as building material.

Limestone. Height 200mm, diameter *c* 380 (shaft), *c* 540 (lower torus)mm.

SF 6479, C 4014.

8.77 Base fragment
The base has a similar profile to the rather larger 8.75, but the upper torus is proportionately larger, and the execution is inferior: the scotia is crudely cut out with a punch. The proportions of upper torus: scotia: lower torus are 2:2:3. The top and bottom have flat but quite rough surfaces.
Limestone breccia. Height 150mm, width 260mm, diameter *c* 310 (shaft), 390 (lower torus)mm.
SF 14511, u/s.

8.78* Base
The upper surface is cut with a circular groove to define the seating for a column shaft 420mm in diameter. The profile has the chamfered torus similar to 8.75.
Limestone. Height 235mm, diameter 570 (plinth)mm.
SF 12106, M 4846.

8.79* Base fragment
A small piece of the upper torus, fillet and scotia of a base similar to 8.74, but larger, with an estimated shaft diameter of *c* 480mm.
Limestone. Height 65mm, width 140mm.
SF 16, A 1.

8.80 Fragment of base moulding
Probably part of the upper torus and fillet of the base of a column *c* 500mm in diameter, or possibly the astragal from the top of a column shaft.
Limestone. Height 37mm, width 55mm.
SF 4038, D 419.

8.81* Base fragment
A segment forming about one-fifth of the whole, broken above the lower torus. Mortar adhering from re-use.
White, grey and red marble breccia. Height 180mm, width 240mm, diameter *c* 500 (lower torus)mm.
SF 9002, M, u/s.

8.82 Base fragment
Piece of the lower torus and plinth of a base similar to 8.74, and of similar size, comprising about one-fifth of the circumference.
Limestone. Height 175mm, diameter *c* 480 (lower torus)mm.
SF 14510, u/s.

8.83* Base fragment
Scotia and lower torus of a smaller base than those preceding.
Limestone. Height 78mm, width 155mm, diameter 260 (lower torus)mm.
SF 12096, M 4839.

8.84* Base fragment
It appears to be part of a lower torus, carved as a quarter-round. The curvature indicates a diameter for the torus of *c* 470mm.
Limestone breccia.
Height 115, 190 × 50mm.
SF 13, A 1.

8.85* Base or capital fragment
Similar to 8.84, but with distinctive toolmarks of a punch in diagonal lines on the underside of the plinth, cleared by chiselling along the edges. If inverted, could have been the abacus and echinus of a plain-moulded capital.
Limestone. Height 73mm, 80 × 65mm.
SF 79, C 30.

MOULDINGS

ORNAMENTAL MOULDINGS (Fig 8.17)

8.86* Cymation fragment
Decorated with a raised pointed oval which is probably part of a lesbian cymation.
Limestone. Height 70mm, width 70mm.
SF 6564, C, u/s.

8.87 Bead and reel fragment
The faces of the block are squared, but with the rough surface from dressing with a punch. At the bottom of the front face is a version of bead and reel ornament in which a long bead alternates with two small ones. The block would appear to have been an architrave or cornice from which all the mouldings have been removed except the lowest.
Shelly limestone. Height 81mm, width 166mm, max depth 58mm.
SF 14529, C 368, built into the south face of the Roman gate.

8.88* Decorated veneer
The face is cut with a leaf-like motif in cameo within a recessed semicircle. The lower edge is slightly beaded, the other sides are broken.
White marble. Height 70mm, width 68mm, thickness 23mm.
SF 7126, F 3001.

8.89* Corner moulding
Carved on two adjacent sides with a cavetto moulding, the other two broken. Above the cavetto, the fascia has an inclined leaf with a small side-lobe carved in low relief to the left of the corner. The fascia to the right does not appear to have been decorated.
Limestone breccia. Height 120mm, 210 × 50mm.
SF 4211, D 451.

8.90* Corner moulding
Carved at the corner with a leaf with a small lobe at each side, outlined by a V-shaped channel. The mouldings below are sharply cut. Possibly the corner of a small altar.
Limestone. Height 122mm, 105 × 95mm.
SF 8084, F 3088.

PLAIN MOULDINGS (Figs 8.18–8.20)

8.91* Architrave and frieze
The upper part of the profile has an undecorated

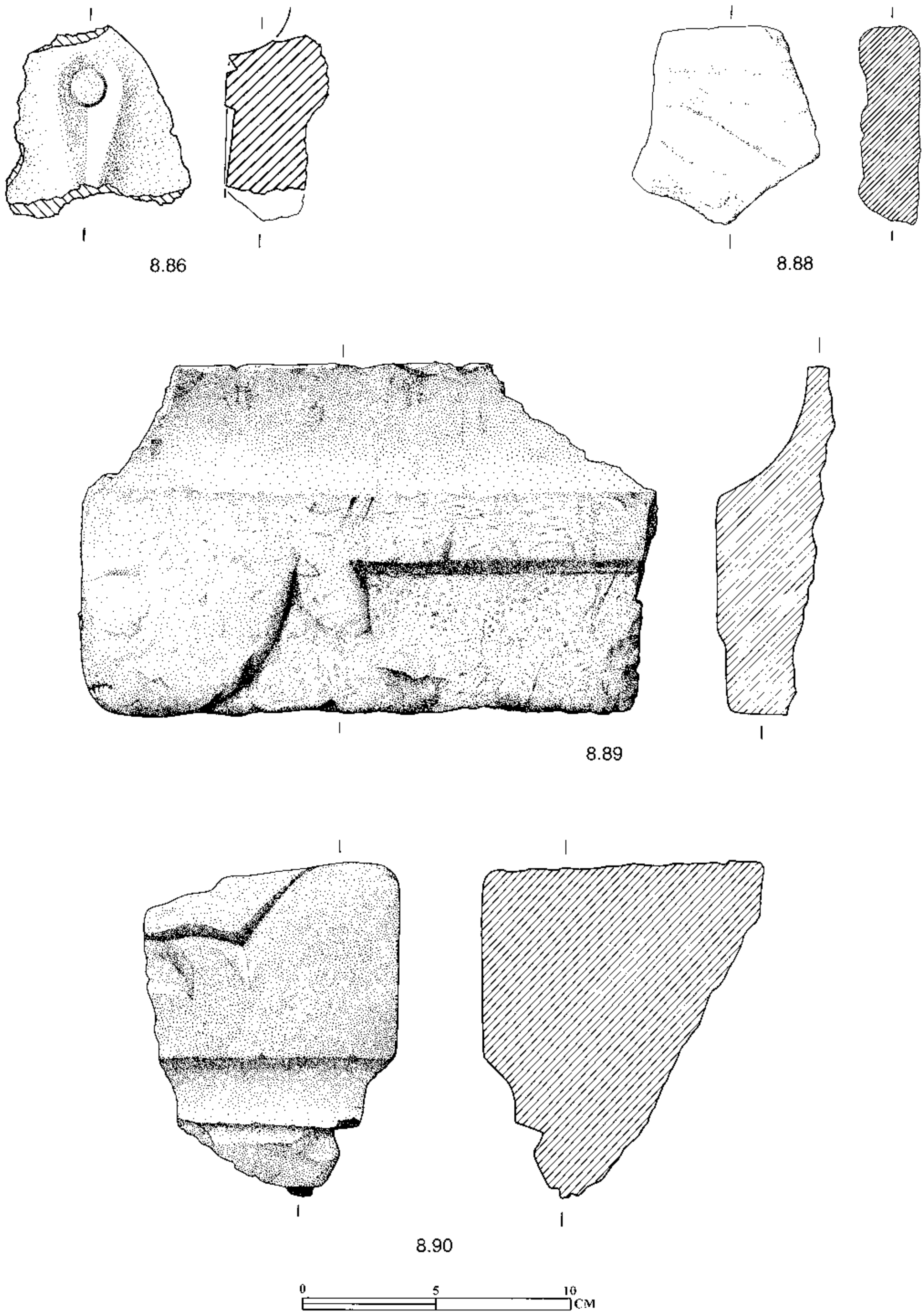


Fig 8.17 Ornamental Mouldings

convex frieze, separated by a cyma moulding from the three inclined fasciae of the architrave. The scale and the combination of the two architectural elements on a single block indicate that it was made for a building of modest proportions.
Limestone. Height 60mm, width 175mm, depth 36+ mm.
SF 3342, E 1200, *in situ*, built into the south-east corner of the gate.

8.92 Architrave
In its re-used position the soffit, or underside of the architrave, decorated with a recessed convex panel, is exposed in the wall face, so that the mouldings of the architrave are contained within the wall. Only one end of the convex panel remains, the other end having been removed before re-use.
Limestone. Height 55.5mm, width 144mm, depth 50.5mm.
SF 14528, C 359, *in situ*, reused in the south face of the Roman gate.

8.93 Cornice
This is shown to be part of a raking cornice, ie, from the sloping side of a pediment, by the dentils at the base which are cut at an angle to the line of the other mouldings. Above them, the underside of the corona, the projecting part of the cornice, has the profile of the modillions standard on a Roman Corinthian cornice, but is carved as a continuous soffit. The size of the structure to which it belonged is shown by the proportions of the mouldings, which are similar to those of the pediment of the Thermoperipatos building opposite the south-east corner of the agora, though that differs in having decorated mouldings (Ivanov and Ivanov 1994, 133, pl. 119a).
Limestone breccia. Height 38mm, width 107mm, depth 88+ mm.
SF 14520, on ground surface near north-east corner of the early Byzantine city.

8.94 Moulding
A fragment of the corona of a small cornice, with the outline of a broken modillion. The carving of the mouldings stops 30–40mm short of the left edge, indicating that the piece decorated an internal corner.
Grey limestone breccia. Height 100mm, width 215mm, depth 175mm.
SF 14519, u/s.

8.95* Moulding
The upper part of the profile is broken, and the sides and back are irregular. The surviving mouldings are similar in profile to those of 8.96, except that there is part of a large cavetto at the top, where the other piece has a sima. Their tooling is also very similar in technique, with a band of flat chiselling used below the lower edges of the fillets, and claw chiselling otherwise. The two pieces may thus have come from the same building, though from different parts of it.
Limestone breccia. Height 300mm, width 500mm, depth 500mm.
SF 14514, D, u/s.

8.96* Moulding
The upper part and both sides are broken. Similarities to the preceding item in profile and tooling have been noted above. A rebate 14.5mm deep has been cut through the mouldings on the left side.
Limestone breccia. Height 310mm, width 480mm, depth 880mm.
SF 3048, E 1035.

8.97* Moulding
A fragment broken at the top and bottom and on two adjacent sides, with small-scale mouldings on the other two.
Shelly limestone. Height 95mm 115 × 115mm.
SF 1174, E 33.

8.98* Moulding fragment
Broken on all sides, so that it is unclear whether the profile was inclined at an angle, as in a cornice, or vertically, as on a panel.
Limestone. Height 114mm, width 90mm, thickness 60mm.
SF 10263, K 4501.

8.99* Moulding fragment
Carved with the lower part of a cavetto and an uncut ovolo, with part of the dressed bottom surface surviving. Possibly the base moulding of a pilaster or panel.
Limestone. Height 170mm, width 100mm, depth 95mm.
SF 7285, F 3045.

8.100* Moulding
Carved with a fascia and a cyma recta above a vertical face. The top is roughly carved, the bottom dressed flat. Mortar adhering to the face indicated re-use.
Limestone. Height 24mm, width 95mm, depth 105mm.
SF 7373, F, u/s, robber-trench.

8.101* Moulding fragment
Part of the base of a medium-sized moulding, carved with a cyma recta undercut as an eaves-drip.
Shelly limestone. Height 85mm, width 130mm, depth 135mm.
SF 13504, S 5255.

8.102* Moulding
Carved with the lower part of a medium-sized cyma recta moulding.
Limestone. Height 110mm, width 115mm, depth 130mm.
SF 14497, C 4101, *in situ*, built into the wall of an early Byzantine building.

8.103* Moulding
A large cyma recta moulding. The underside is irregular, suggesting that a larger block has been

split horizontally for re-use. Possibly that was as paving, to judge from wear on the top and the moulding.
Limestone. Height 210mm, width 510mm, depth 735mm.
SF 6477, C 4014.

8.104 Moulding
A wedge-shaped block: the right side is at an acute angle to the face, which is carved at the top with a shallow cavetto moulding. The relationship between these sides shows that the piece cannot have been the voussoir of an arch, since the taper is in plan, not in elevation. It may therefore have come from a polygonal structure.
Limestone. Height 145mm, width 120mm (front), 75mm (back), depth 265mm.
SF 4041, D 421.

8.105* Moulding
Fragment from the top of a block, carved with a fascia and a shallow cavetto. It could be the upper part of the profile of which 8.101, which has the same provenance, was the bottom. Mortar in the cavetto indicates re-use.
Shelly limestone. Height 112mm, width 205mm, depth 130mm.
SF 13503, S 5255.

8.106* Moulding fragment
A piece of a corner block, carved on two adjacent sides with the fascia and cyma profile of a moulded panel, the other sides broken.
Limestone. Height 135mm, 185 × 95mm.
SF 2112, B 241.

8.107* Moulded panel
A piece from one corner of a panel bordered by an outer fascia and a cyma within it. The back is partly rebated back to give a thickness of 112mm. The broken left side has mortar adhering, indicating re-use.
Limestone. Height 170mm, width 150mm, depth 125mm.
SF 6670, C 4213.

8.108* Stele
The front and sides are dressed with a claw chisel and carved with cyma and ovolo mouldings at the base. Those on the left side have been cut back and partly chamfered off. The profile of the mouldings is similar to those of 8.109. The back was more roughly cut with a punch, either not intended to be seen, or as secondary work. Two square holes 45mm deep, possibly for metal bolts, are cut in the front. The top is broken.
Limestone. Height 790mm (shaft 580), width 455mm (shaft), 580mm (mouldings), depth 145mm (shaft), 215mm (mouldings).
SF 4106, D 451.

8.109 Corner moulding
A corner piece, carved with mouldings on two adjacent sides. Their profile, with a cyma, an ovolo and fillets, is similar to that of the preceding item, suggesting that this piece may have also come from a stele. The combination of flat and claw chisels on individual mouldings is a very similar technique to that noted on 8.95 and 8.96, and so possibly the work of the same mason or workshop.
Shelly limestone. Height 195, 135 × 100mm.
SF 14517, D, u/s.

8.110* Corner moulding
The section of profile and technique of tooling match those of the preceding item, though whether from another corner of the same piece of stonework, or from a companion piece, cannot be certain.
Shelly limestone. Height 85mm, 75 × 70mm.
SF 4037, D 420.

8.111 Base moulding
Decorated with a bold cyma moulding and with fillets which have slightly recessed flat-chiselled borders to their claw-dressed surfaces. Possibly part of a pedestal.
Limestone. Height 24mm, width 30mm, depth 38mm.
SF 12395, M 12395.

8.112* Moulding fragment
Part of the middle section of a profile, broken all round.
Limestone. Height 130mm, width 190mm, depth 160mm.
SF 12328, M 4927, *in situ,* built into the foundation of an early Byzantine building.

8.113* Base moulding
In two pieces, one fitting on top of the other. The top is broken, the underside very roughly dressed with a punch. The front is cut with mouldings which stop 30mm short of the left-hand edge, suggesting that the block may have formed an internal corner.
Limestone breccia. Height 270mm, width 630mm, depth 510mm.
SF 14515, u/s.

8.114* Moulding fragment
The cyma moulding has a very bold double curvature which would be suitable for the base of a bench or, if used the other way up, for a corbel or console. The top, back and one side are broken.
Limestone. Height 130mm, width 75mm, depth 86mm.
SF 5277, A 2159.

8.115* Moulding fragment
Neatly dressed on three sides with a bold cyma moulding, this could be the base or capital of a small pilaster. There is a rectangular dowel- or cramp- hole in the central carved side below the flat-chiselled margin 15mm wide which underlies the moulding, for joining on to something at the bottom.
Limestone. Height 145mm, width 185mm, depth 162mm.
SF 14516, u/s.

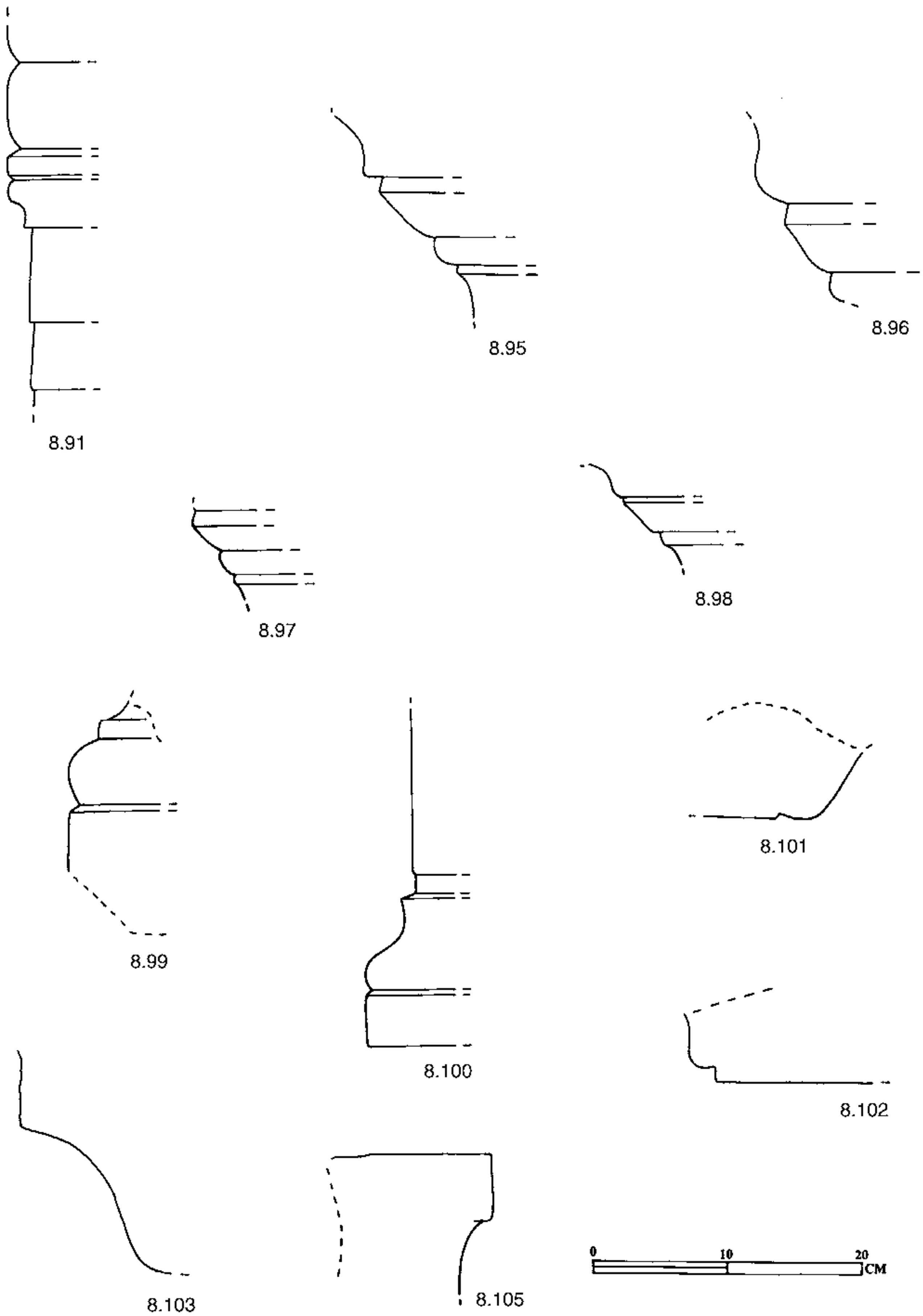


Fig 8.18 Plain Mouldings

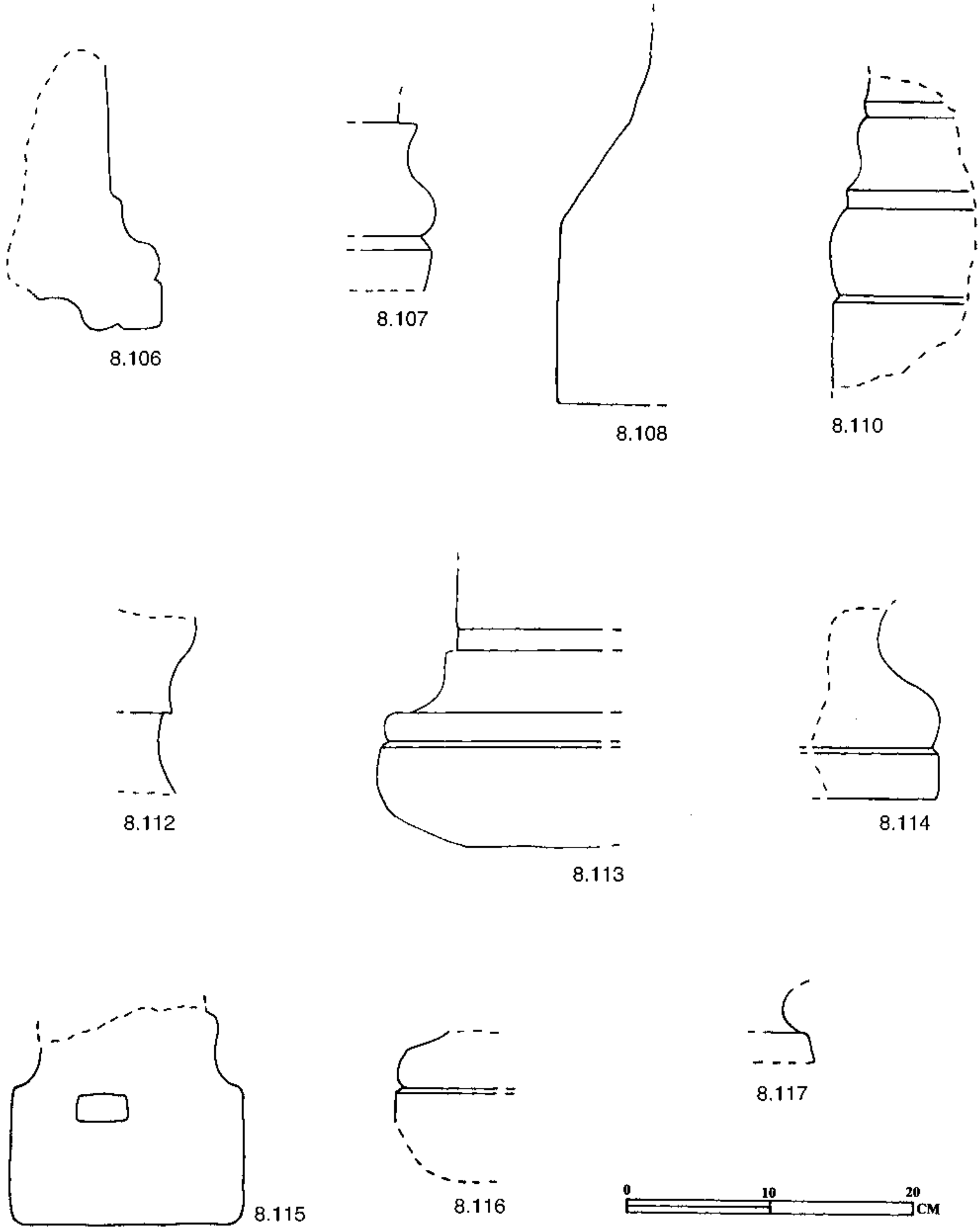


Fig 8.19 Plain Mouldings

8.116* Moulding fragment
Small piece of a medium-sized cyma moulding, broken all round.
Dark grey and white marble breccia. Height 95mm, width 115mm, depth 100mm.
SF 45, A 23.

8.117* Corner moulding
Carved with a cavetto moulding on two adjacent sides, the other sides and the top broken. Very abraded.
Limestone. Height 65mm, 150 × 120mm.
SF 14356, P 5032.

8.118* Moulding
Broken both ends. There is a drilled pin-hole in the base.
White marble. Height 80mm, width 200mm, depth 80mm.
SF 14004, C, u/s.

8.119* Moulding
The back has a raised area 20mm wide from where the veneer has been broken at the base of the sawn cut. Much weathered.
White marble. Height 67mm, width 158mm, depth 63mm.
SF 5291, A, u/s.

8.120* Pilaster or string course
One side has a projecting rib, cut at a slight angle to the adjacent sides. Slight flanges project at the back from where the strip has been sawn off the parent block.
Coarse white marble. Height 110mm, width 71mm, depth 87mm.
SF 4177, D 452.

8.121* Panel or pilaster
Cut with angular grooves on both sides. One end broken.
White marble. Height 220mm, width 192mm, thickness 53mm.
SF 13016, R 5205.

8.122* Panel or pilaster
Cut with a rebate on one side for 200mm of its height. Broken both ends.
White marble. Height 249mm, width 195mm, thickness 71mm.
SF 13017, R 5205.

8.123* Strip veneer
Rebated along both edges. The back is fairly irregularly dressed with a punch. Broken both ends.
White marble. Height 160mm, width 97mm, thickness 37mm.
SF 3191, E 1072.

8.124 Half-round moulding
In plan the piece forms part of a disc, 70mm in diameter. The profile of the half-round is weathered, and too rounded for it to have been a piece of *opus sectile*, and it may therefore have been a torus moulding.
White marble. Height 27mm, width 40mm, thickness 30mm.
SF 14134, P 5017.

8.125 Corner of palette
The upper surface is smoothly polished.
Clouded red marble with narrow blue veins.
Max thickness 8mm (max), 46 × 29mm.

8.126* Concave moulding
Perhaps part of a fluted pilaster in veneer.
White marble. Thickness 20mm, 63 × 35mm.
SF 44, A 10.

8.127* Fluted strip
White marble. Thickness 11mm, 41 × 40mm
SF 4299, D 86.

8.128 Moulding
Pink and cream breccia. Thickness 18mm, 25 × 25mm.
SF-, 3508, S 5260.

FLOORING (Fig 8.20)

8.129 Lozenge (*opus sectile*)
Yellow mudstone. Thickness 34–37mm, 130 by 58mm
B 248.

8.130 Rectangle (*opus sectile*)
Blue-grey veined white marble. Thickness 12mm, 74 × 39mm
SF 4960, D 86.

8.131* Strip (*opus sectile*)
Grey marble. 81 × 27mm.
SF 14397, P 5049.

MISCELLANEOUS (Figs 8.21–8.22)

8.132 Arched block
The block has a chamfered projection along the base at the front. The lower part of the broken right-hand side is cut with an arch, the curvature of which suggests an opening 0.65 m wide. There is an offset of 50mm cut in the back.
Shelly limestone. Height 94mm, width 79mm, depth 70mm.
SF 14341, P, u/s.

8.133 Threshold block
The surface is cut with a central rectangular hole for a bolt, and holes for bar cramps on one long and one short side.
Shelly limestone. Height not known, width 118.5mm, depth 22.5mm.
SF 14526, C 4033, embedded in section.

8.134* Socketed stone
The domed top has a vertical socket 45mm wide and of the same depth cut in front of it. The semicircular base of the socket is worn very smooth by the rotation of a rod, eg, that of a windlass, which has cut down into the small surrounding ledge. Below that is a vertical panel, and the sides and back then taper down to a shaft

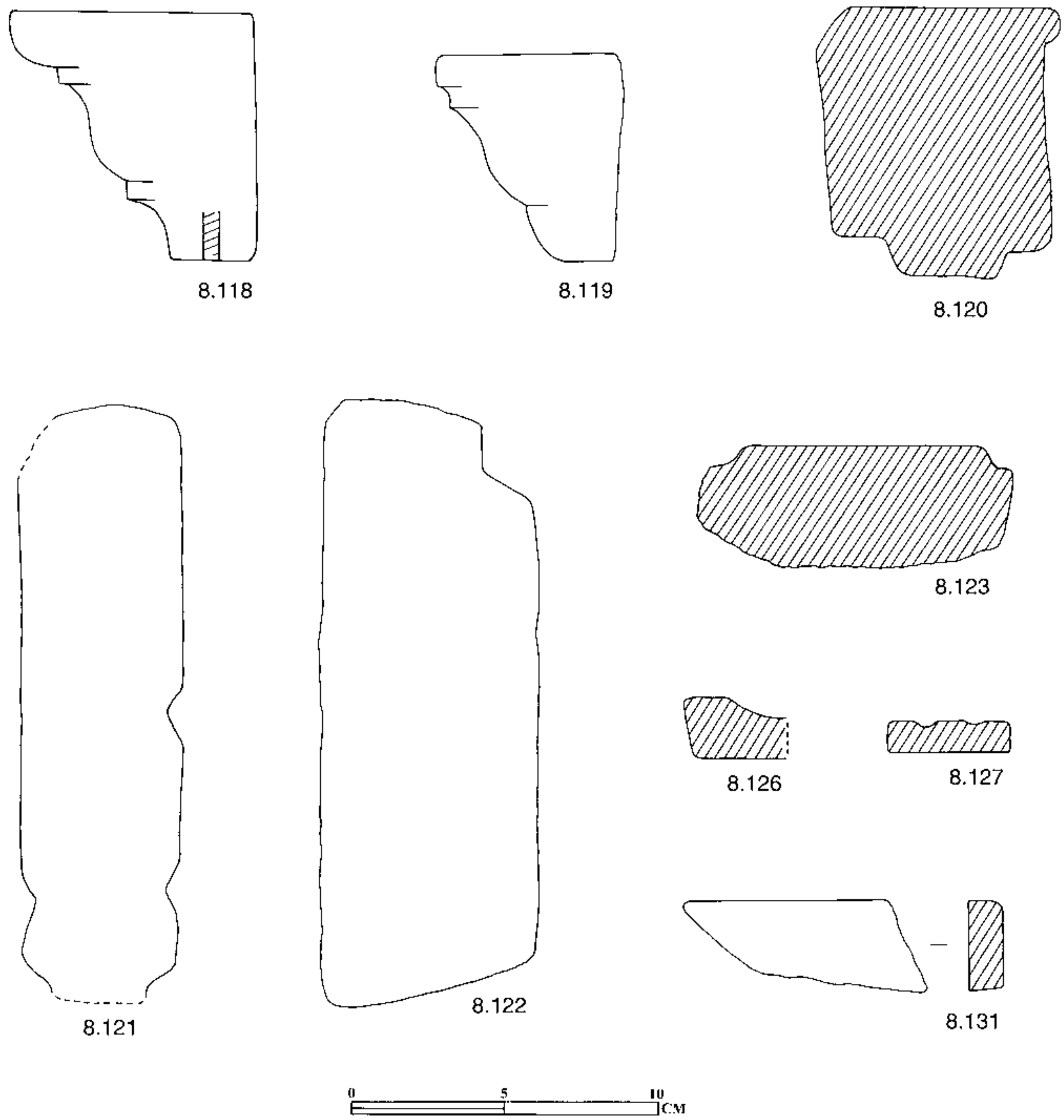


Fig 8.20 Plain Mouldings and opus sectile

150 × 105mm in cross section.
Shelly limestone. Height 360mm, width 195mm, depth 130mm.
SF 3189, E 1054.

8.135 Concave-sided stone
The central part is waisted and worn much smoother than the vertical faces. It is broken all round, except on one side. Perhaps part of a bollard used for some function causing abrasion, eg, for securing ropes for haulage or tethering animals. The stone has been exposed to fire, causing cracking and reddening to the lower part. Use as a hypocaust pila is another possibility.
Sandstone. Height 245mm, *c* 230 × 230mm.
SF 12003, L 4612, u/s.

8.136 Chamfered block
Fire-reddened.
Limestone. Height 175mm, width 290mm, depth 175mm.
SF 12327, M 4927, *in situ*, re-used in the foundation of an early Byzantine building.

8.137 Chamfered block
Limestone breccia. Height 100mm, 220 × 210mm.
SF 14512, u/s.

8.138 Block
The front has each corner cut back to a depth of

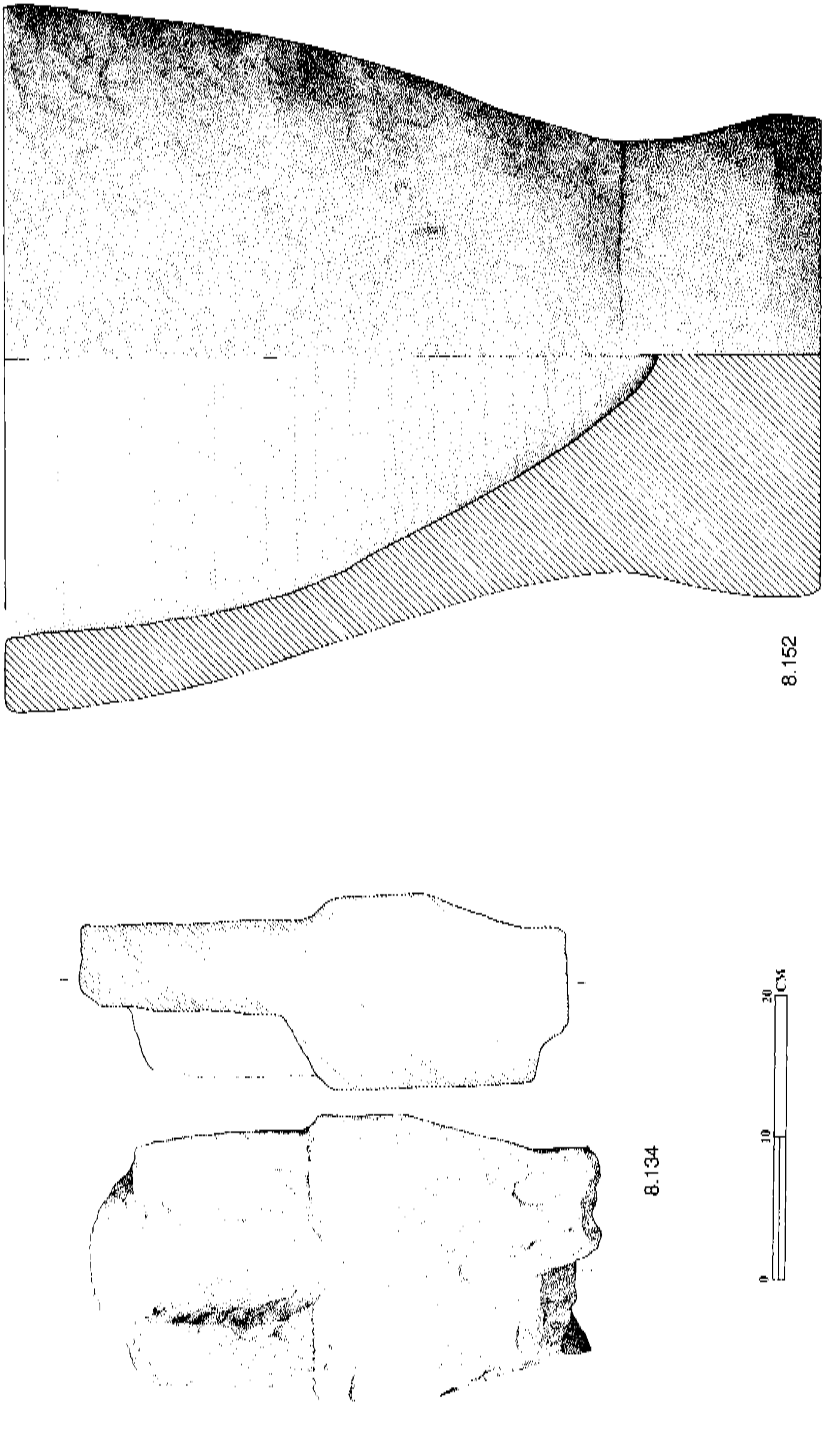


Fig 8.21 Miscellaneous stone finds

c 0.3 m, and the part left projecting has a rebate 50mm wide and 30mm high, all roughly dressed with a punch. There is a cramp hole in one end.
Shelly limestone. Height 41mm, width 136mm, depth 86mm.
SF 6480, C 4014.

8.139 Rebated block
Cut with a rebate 25mm deep and 20mm high along one edge. The right hand side is cut at an oblique angle to the face.
Limestone. Height 170mm, width 100mm, depth 82mm.
SF 14088, P 5005.

8.140 Block with offset
Has an offset ledge 35mm deep, 80mm high, along the bottom of one face.
Shelly limestone. Height 170mm, width 290mm, depth 210mm.
SF 3180, E 1035.

8.141 Fragment of rebated block
Sandstone. Height 80mm, width 155mm, depth 130mm.
SF 17, A 1.

8.142 Worked stone
Has three adjacent worked faces, two meeting at an angle of 130 degrees, with a rebate along that angled edge. The other sides are broken and worn. Re-used: mortar adhering.
Limestone. Height 85mm, 200 × 190mm.
SF 8242, F 3296.

8.143 Worked stone
Block of unclear purpose, cut with three adjacent splayed sides, the middle one of them slightly concave.
Limestone. Height 80mm, width 85–115mm, length 145mm.
SF 12064, M, u/s.

8.144 Stone tile
Limestone. Width 65–80mm, length 85mm, thickness 21–25mm.
SF 14386, P 5049.

8.145 Channelled block
The rear, top and right side are dressed with a punch, the underside more roughly. The left side and front edge are broken. The channel, *c* 80mm deep, has a lime deposit at its base.
Shelly limestone. Height 24mm, width 52mm, depth 69mm.
SF 14527, C 4087.

8.146 Channelled block
Similar to the preceding, and also has a deposit of lime or plaster in the channel.
Limestone breccia. Height 24mm, width 43mm, depth 53mm.
SF 6473, C 4014.

8.147 Channelled block
Limestone breccia. Height 24mm, width 33mm, depth 56mm.
SF 6475, C 4014.

8.148 Channelled block
Limestone breccia. Height 110mm, width 450mm, depth 270mm.
SF 14491, C 29.

8.149 Channelled block
Limestone breccia. Height 190mm, width 340mm, depth 610mm.
SF 14492, C 4091.

8.150 Drain-pipe block
The fragment forms one corner of a square or rectangular block with a circular perforation of *c* 300mm diameter when complete. Around its perimeter is a raised half-round edging which would engage with a corresponding cavity on the next block.
Shelly limestone. Thickness 165mm, 340 × 275mm.
SF 14521, u/s.

8.151 Perforated block
The block has one rectangular corner, neatly dressed on one side and roughly squared with a heavy punch on the other. Cut into one of the broken sides is the greater part of a cylindrical perforation 180mm in diameter.
White/grey/red marble breccia. 550 × 490mm, thickness 190mm.
SF 14522, u/s

8.152* Mortar
Conical mortar with an expanded vertical base. The exterior is dressed with a punch, and the interior more smoothly with a claw chisel. It measures 460mm deep internally, and on the lower 260mm the toolmarks have been smoothed away by wear. (Poulter 1995, plate XXVIII a).
Grey marble. Height 545mm, diameter at top 485mm (outer), 380mm (inner).
SF 12462, M, *in situ*, standing on the floor in room 3.

8.153 Mortar
The lower part of a mortar similar to the above.
Dark grey and white marble breccia. Height 175mm, diameter at base 235mm.
SF 6641, C, u/s.

8.154* Quern or millstone fragment
The underside is cut with milling grooves. Two sockets are cut in the side, and there is a square hole in the top. Presumably these were for a handle or attachments to whatever apparatus rotated the stone.
Limestone. Width 180mm, depth 140mm, thickness 85mm.
SF 2609, B 293.

8.155 Quern fragment
A segment comprising about one-fifth of the millstone.
Basalt. Width 155mm, depth 100mm, thickness 85mm.
SF 14437, on ground surface, near the river, south of the early Byzantine fortifications.

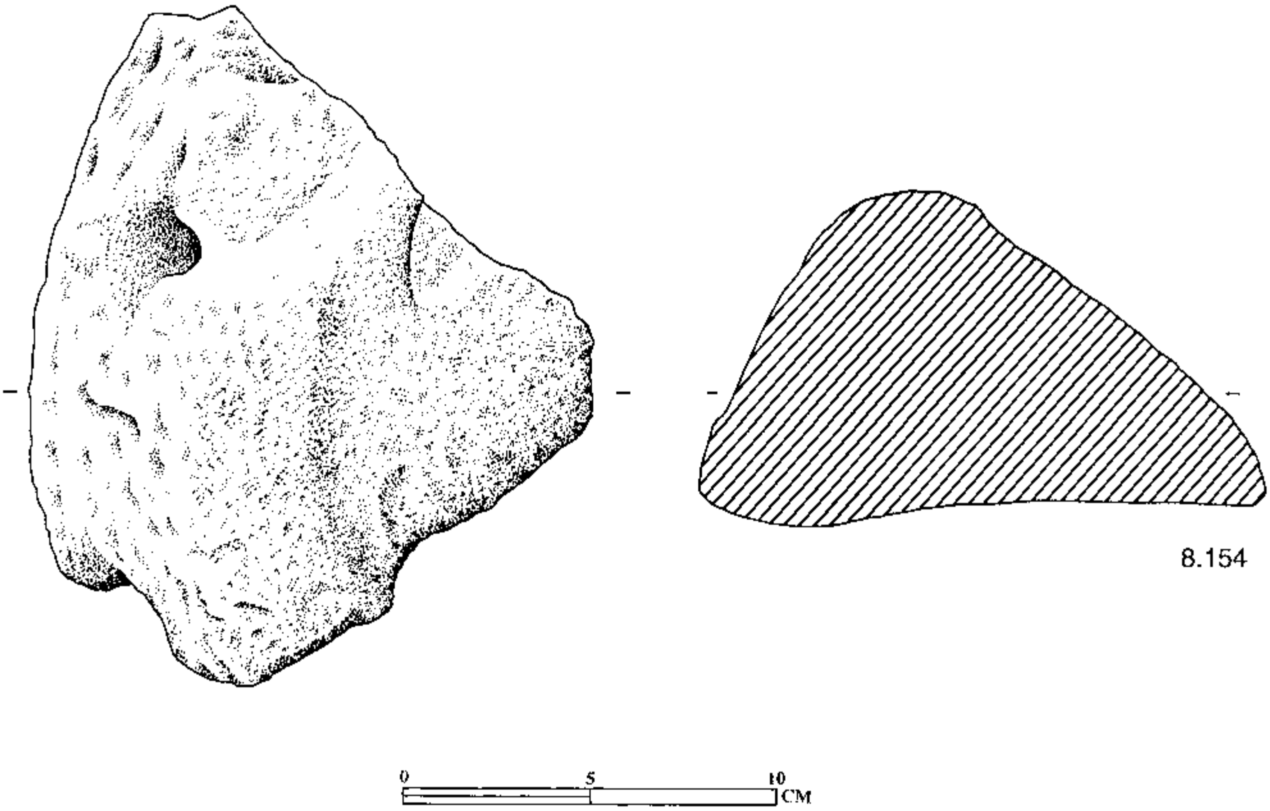


Fig 8.22 Quern fragment

THE WORKED PREHISTORIC LITHIC MATERIAL AND ITS POSSIBLE RE-USE

by

John Chapman and James Kenworthy

Twenty-four pieces of chipped stone were recovered from the excavations; they are listed in Table 9.1 and significant pieces illustrated in Figure 9.1. The small number of pieces suggests that there was no significant prehistoric occupation of the site. Material came from all periods; a few pieces may have been reused as strike-a-lights, and some of the material may have been deliberately 'collected'. Chance transport of the material to the site over its life would also explain the presence of some of the pieces. Only significant details are discussed here, but a full description of each piece has been prepared and is in the archive.

Description

The pieces are divided into six categories based on lithic raw material sources.

Group 1: Radiolarite (? Eastern Rhodopes)

Three pieces of radiolarite occur, ranging in colour from red to dark red. The radiolarite is close to the lithics found in Sedlare (unpublished arch. Museum, Kardzali). The medial blade segment SF 14911 bears traces of sickle gloss on the right ventral side. The pieces were found in contexts ranging from 100/300 to 450/600 – one each in Areas D, F and P. Two of the pieces were probably used as strike-a-lights (SF 14911 (9.4) and SF 14264 (9.5)).

Group 2: Dark Brown Flint (Prut – Dniestr zone)

A single piece of dark brown flint from the Prut-Dniestr sources to the North East, in present-day Ukraine and Moldavia. The principal period of Prut-Dniestr lithic export to the Lower Danube Basin is the 5th millennium CAL BC (cf, Comşa 1974, fig 73). SF 14151 (9.3) is a blade segment, probably re-used as a strike-a-light and it comes from a context dated *c* 450 in Area P.

Group 3: Dark grey – black flint (Rhodopes)

Three pieces of dark grey to black flint occur, one a core fragment with the remains of seven bladelet scars and another a medial blade segment. One piece was found in a context dated *c* 450, the two others in contexts dated 1750+ – one each in Areas K and P. There are no obvious signs of re-use as strike-a-lights.

Group 4: Dark grey flint (Pre-Balkan Platform, North East Bulgaria)

Six pieces of dark grey flint occur, each with white mottles distinctive of the Pre-Balkan Platform flint found over a wide area in northern Bulgaria. The only item of particular interest here is SF 4726, from a second-century context. It is an incomplete flake of grey flint, with part of the original thick chalky cortex remaining, and is the only piece from the site with evidence of cortication (white surface modification); a typologically undiagnostic piece, it may well be the oldest from the site. SF 14912 was

Table 9.1 chipped stone

SF	Area	Context	Mat Type	Date	Notes	Type
15511	-	U/s	3	-	surface	HH flake
2508	B	258	4	130/150		struck ang frag
4726	D	699	4	130/150	Cortic	2y fl dist
8060	F	3001	4	1750 +		c/t flake
1245	E	1031	4	450/600		HH flake
7539	F	3130	6	1750 +		bladelet prox half, pch
8091	F	3194	6	1750 +		SH bladelet
15507	K	4401	6	1750 +	topsoil	SH flake
14264	P	5020	1	300/450		wedge/s-a-l on pr flake/blade
14911	D	607	1	450/600		blade mes, s-a-l?
14151	P	5018	2	*c* 450		?s-a-l on pr blade+G12
14285	P	5014	3	*c* 450		blade mes
2512	B	265	5	130/150		HH flake or fl prox
4356	D	559	5	400/450		?SH fl/bl prox
14571	E	1055	5	450/500		blade mes
8055	F	U/s	5	-	unstrat	end scr on blade mesial, s-a-l reuse, or check if gun-flint?
1236	E	1031	6	450/600		broken ?side-scraper
15508	K	4401	6	1750 +	topsoil	HH flake
15509	K	4401	6	1750 +	topsoil	flake frag
14340	P	5024	1	100/300	old soil	burnt fragment
15510	K	4401	3	1750 +	topsoil	burnt frag
14912	P	5052	4	100/300		C/T flake
14474	C	114	5	1750 +		backed bladelet
12201	M	4883	4	1750 +	topsoil	flake

possibly re-used as a strike-a-light (9.2). The contexts of discovery range in date from 100/130 to 1750+, one each in Areas B, D, E, F, M and P.

Group 5: Brown flint (Pre-Balkan Platform, North East Bulgaria)

Five pieces of brown flint occur, each with the white mottling characteristic of Pre-Balkan Platform flint from the Radingrad area (Sirakov and Tsonev 1995). This is one of the commonest lithic raw materials in the Copper Age of the East Balkans. The material includes two bladelets (one incomplete), detached by soft hammer and punch percussion respectively, a soft-hammer struck core-trimming flake, two hard hammer flakes and one soft hammer flake, and a flake fragment. This is an industry involving the removal of bladelets from pyramidal or prismatic cores and characteristic of a wide range of periods, from the Epipalaeolithic to the Late Chalcolithic (*c* 9000 – *c* 4000 BC). An important piece is SF 14474 (9.1), from a post-medieval rubble spread in Area C (context 114). Of slightly translucent mid brown flint, this is a backed bladelet which is characteristic of the microlithic Mesolithic industries of the area (cf, Kozłowski 1973, Gatsov 1989). However, there are also examples of such backed bladelets in Early Neolithic industries in the Lower Danube Basin. SF 8055, (area F, unstratified) is an end-scraper on the medial segment of a trapezoid-sectioned blade (9.6). It bears later damage along both edges and distally, and although this may be due to use as a strike-a-light, it is also possibly due to use as a wedge in prehistory.

The range of areas and dates for this group is wide and diverse: 100/130 to 1750+, one piece each in Areas B, C, D, E and F.

Group 6: Light brown flint (Pre-Balkan Platform, North East Bulgaria) (9.7)
The largest group, with six pieces of light brown flint with white mottling, characteristic of Pre-Balkan Platform flint from the Lovech – Turnovo anticline and nearby valleys, in North East Bulgaria. Two of the pieces are flakes with no retouch, while four are blades or blade segments from prepared cores. One of the latter, SF 1236, is a side-scraper on a medial blade segment. There is no clear evidence of re-use as strike-a-lights in the Roman to early Byzantine periods. These pieces came from two periods; 450/600 and 1750+ .One piece was found in Area E, two in Area F and three in Area K. While more of the material falls in the period from *c* 450 on, and this includes the definite strike-a-lights, the sample is so small that the historical significance of this is statistically insignificant. It does seem reasonable to suggest that this material is being brought to Nicopolis over a fairly long period. That this might have been intentional is suggested by the strike-a-lights (see below, p. 153) and the presence of indeterminate edge-damage on several other pieces could indicate similar but transient use. The source of the material is discussed below.The pieces come from highly skilled working of fairly large prismatic blade-cores, which are typical of the Neolithic and Chalcolithic industries of the East Balkans (see below). This is supported by the character of the raw material: it is well-known that the so-called 'honey-coloured' flint from North East Bulgaria is the most important raw material during much of the Neolithic and Chalcolithic. Two certainly, possibly four, of the pieces (SF 14151, 14911, 14264, 8055) have been re-used as strike-a-lights (see 9.3–9.6), and all bear some edge damage, although in most cases this is not obviously more recent than the primary age of the pieces.

Raw Material Sources

Most of the pieces comprising the Nicopolis lithic 'assemblage' are typical for the source areas of *in situ* later prehistoric lithic assemblages from northern Bulgaria. A good example is the Hotnitsa Vodopad assemblage (Sirakov and Tsonev 1995), in which six flint raw material classes were identified. BG – Hv – F1 is comparable to Nicopolis Group 6, BG – Hv – F4 is similar to Nicopolis Group 4 and BG – Hv – F6 is similar to Nicopolis Group 5. Two of the three other Hotnitsa flint classes local to the area, as well as the Kriva Reka variety from the Sumen area, are absent at Nicopolis.

There are thus two possibilities for the source of the Nicopolis lithics. First, the citizens may have collected the lithics from raw material sources in the vicinity which they may have visited, presumably in the search for good-quality quarry-stone. This may have applied to Groups 4 and 6, which are known in the vicinity of Hotnitsa and further afield. The second possibility is that the citizens visited prehistoric sites and collected lithics from the surface. This is a possible source for Groups 4 and 6 but the only possibility for non-local Groups 1 – 3 and 5. Todorova (1978, Map 2) indicates that settlement mounds occur from the Copper Age (after *c* 4800 BC) in the region, and her Map 3 indicates that several sites occur within 10 km of Nicopolis. Of more interest is the propinquity of one of these sites, Hotnitsa (Angelov 1958, Todorova 1978, Map 4, no 43) to the main quarries which provided Nicopolis with building stone and was also one of the pottery centres supplying the Roman city.

The Group 5 flint appears to show a close macroscopic resemblance to flints from the Radingrad area, some 80 km from Hotnitsa. While the Radingrad sources include high-quality surface deposits, recent investigations of a flint mine at Radingrad suggest Chalcolithic usage of this source.

The radiolarites from the Rhodopes are a small group of rather unspecific technology, including an example of sickle gloss; yet the raw materials are quite distinctive. The Eastern Rhodopes are more likely to be the source for these pieces than the Western Rhodopes (pers com B. Gaydarska). The other group comprises three pieces of dark grey – black flint from the Rhodopes, one of which is a fragment of an exhausted core. A distance of 200 – 250 km separates Nicopolis from the source areas.

The single example of a Dniestr-Prut blade segment says little about the process of prehistoric trade and exchange but does indicate that some of this valuable and high-quality material had probably been

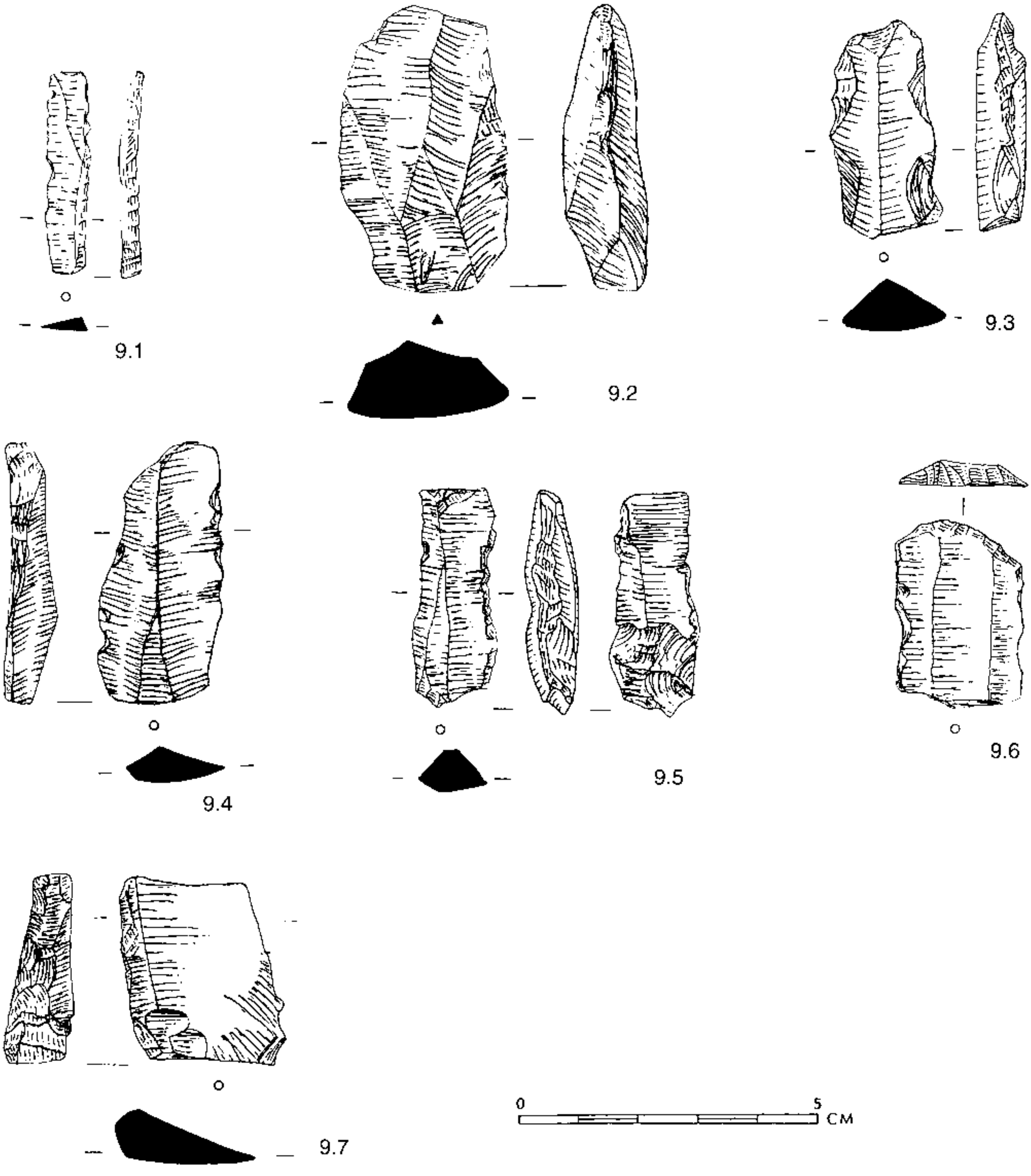


Fig 9.1 Prehistoric Lithics

moved south of the Danube. This may indicate an extension in the exchange network to that proposed for the Boian period (Comşa 1974, fig 73). The distance from the closest outcrops of Dniestr flint to the site of Hotnitsa is *c* 500 km.

None of these 'imports' would be out of place in a high-status lithic assemblage from a north Bulgarian Chalcolithic tell such as Hotnitsa. An extensive exchange network involving lithics, metals, marine shells and pottery characterises the East Balkan Chalcolithic (Renfrew 1986, Todorova 1993b, Chapman 1991, Gaydarska *et al.* 2004). Collection from a nearby prehistoric site would have been an easy task, given the infrequent occurrence at Nicopolis and the minuscule weight of the pieces, which amount to less than 1 kg.

Dating

The date of the lithic items is complicated by their general lack of specificity and by the long time-period over which pressure-flaked blade production is attested in the lower Danube valley. In the Early Neolithic, pressure-flaked blades from northern Bulgaria are regularly reaching the Starčevo – Criş sites in or near the Iron Gates gorge from 6000 CAL BC onwards (eg, Lepenski Vir: Kozłowski and Kozłowski 1983). Sirakov and Tsonev (1995) demonstrate continuity in long blade production well into the Early Bronze Age of northern Bulgaria, in the late 4th millennium CAL BC. The Nicopolis 'assemblage' is too small for any convincing relations to be drawn between its tools and the different late prehistoric phases of long blade production.

The single item which gives some reason for a dating earlier in the prehistoric sequence than the other pieces is the microlithic backed bladelet SF 14474, made of Radingrad-type flint. The abrupt blunting retouch providing the backing suggests similarities to the Gravettian-derived technology of the local Mesolithic (the term Tardi-Gravettian is sometimes used: Gatsov 1989). General parallels are known from the Mesolithic of the Iron Gates gorge, where backed pieces are a regular, if minor, element in the lithic assemblages (Radovanović 1996, 238, eg, fig 5.14/1 form Lepenski Vir Level I) and from Pobiti Kamani, the best-attested Mesolithic site in Bulgaria, where half of all microliths comprise backed bladelets (Gatsov 1989, 474). The problem with a Mesolithic date for this piece is the well-known persistence of 'Mesolithic' (Epigravettian) traits well into the Neolithic in the Lower Danube Basin. Thus, Gatsov (1987, 47) identifies five 'archaic' traits deriving from the Epigravettian in the Middle Neolithic chipped stone assemblage of Usoe I. Similar 'archaic' elements comprise minor elements of many Early Neolithic chipped stone assemblages as well (eg, South West Romania, Paunescu 1987). Added to this is the re-emergence of microlithic-sized tools in the Late Neolithic in North Bulgaria (eg, at Samovodene in the Middle Neolithic – Late Neolithic transition: Stanev 2002, Obr. 68), in western Bulgaria (Gatsov 1993b, 36) or in Serbia (Voytek 2001, 294).

In defence of the Epigravettian date for SF 14474, it should be said that the combination of such abrupt blunting retouch on a parallel-sided bladelet with no retouch on the opposite edge is not common outside the Upper Palaeolithic or the Mesolithic. It is much more common to find bilateral blunting retouch on bladelets in the Early Neolithic (eg, Sofia-Slatina: Gatsov 1993a, Obr. 1/3, 14, 17–20, Rakitovo: Gatsov 2002, Obr. 96, Cârcea-La hanuri: Paunescu 1987, fig 3/2, 5/7, Valea Rąii: Paunescu 1987 fig 6/1) and the Middle Neolithic (eg, Usoe I: Gatsov 1987, Pl. V/8, 16). The fact that abrupt blunting retouch was used occasionally for making truncations (eg, Late Neolithic Damianitsa: Gatsov 1993b, 38) indicates widespread knowledge, if little use, of the technique. However, there are a few examples of unilateral abrupt blunting retouch to produce a profile angle of 90^0 – in the Early Neolithic (eg, Sofia-Slatina: Gatsov 1993a, Obr. 1/12, 15 and 16, Obr. 2/9, cf, the Körös example from Besenyszög: Bacskay and Simán 1987, 126 and Pl. 6/13), the Middle Neolithic (eg, Usoe I: Gatsov 1987, Pl. V/11, 13 and 19) and in the Late Eneolithic (eg, Yunatsite: Sirakov and Tsonev 2001, 358–9 and fig 2/4).

To summarise, to the extent that 'archaic' Epigravettian traits survived long into the Neolithic on the Lower Danube, it is less probable that SF 14474 from Nicopolis can be securely dated to the Mesolithic period. While Chapman (1989) has argued for the bias against the discovery of Mesolithic sites in South East Europe, and the Nicopolis piece may be thought to support his argument, the dating evidence for the lithics must be more reliable to be valid supporting evidence for a Mesolithic presence in northern Bulgaria.

On old things

The discovery of old things can produce many responses, of which two reactions relevant to the present case are that the objects may have a contemporary, and immediate use or that the things may have a value in simply being the material representation of a long-gone past. An example of the former is the re-use of Upper Palaeolithic end-scrapers as threshing flints. Another example is the collection of lithics from an earlier nearby site by prehistoric flint-knappers for re-use as 'raw materials'. Some

of the lithics collected over a duration of almost two millennia and deposited at Nicopolis appear to have been re-used as strike-a-lights, in the traditional way.

However, the majority of the Nicopolis pieces show no obvious signs of re-use and yet have been incorporated into a variety of contexts rather than being abandoned at the point of discovery. This suggests the second reasons for an interest in old things may have operated at Nicopolis – perhaps in the same way that Antiquarian collectors valued 'thunderbolts' in the seventeenth century. There is no reason to identify a particular connection which the Nicopolitans may have made between the lithics and the past, or with natural forces, or with other 'peoples' – rather a generalised interest in things that would appear to be older than – perhaps much older than – their own material culture (Bradley 2002).

Conclusion

The small collection of twenty-four lithics from Nicopolis was deposited across the site in a wide range of contexts, spanning almost two millennia. There is no evidence for an *in situ* prehistoric flint assemblage. Instead, it is tempting to suggest that the proximity of the Neolithic and Chalcolithic Hotnitsa tell to Roman stone and ceramics sources may provide the link which accounts for the presence of the material at Nicopolis: the prehistoric site may have been a convenient source of flints for the inhabitants of the city who would seem to have realized the value of flint for fire-making and perhaps other symbolic purposes.

Note

This article represents the marriage of data recorded by James Kenworthy in 1995 and a re-examination by John Chapman in 2003, together with a re-consideration of some of Kenworthy's conclusions. John Chapman wishes to thank Bisserka Gaydarska for her comments on Bulgarian lithics.

THE LARGE MAMMAL AND REPTILE BONES

by

Mark J. Beech

Introduction

A total of 8,022 large mammal bone fragments were identified to species from the 1985–91 British excavations. A further 784 small mammal bones were also recovered from bulk sediment samples and this material is treated separately in this volume (below, pp. 198–223).

The aims for the analysis of the mammalian fauna were as follows;

(a) To determine the major domestic species present and to identify husbandry practices.
(b) To detect any evidence for craft or industrial activities involving the use of bone.
(c) To examine the relative economic importance of domestic and wild resources.
(d) To reconstruct the environmental conditions prevailing in the immediate vicinity of the city, in so far as this can be deduced from the kinds of wild mammal species identified.

As comparatively few large and well-dated animal bone assemblages from archaeological sites in Bulgaria have been published, the assemblage from Nicopolis offers a number of valuable opportunities. These include; providing important evidence about the function of particular excavation areas, the location of particular activities across the site, and contributing to our understanding of the natural environment. Also, in more general terms, it is possible to determine a range of husbandry practices employed by the inhabitants, both in the city and its hinterland, as well as providing data on the type and range of livestock exploited, especially from the Roman to early Byzantine periods.

The author presented an earlier summary of the preliminary results of analysis at the International Council for Archaeozoology Conference held in Konstanz, Germany in 1994 (Beech 1997). This present report represents the final, full publication of the results and the faunal data.

Methods

The animal bones were mostly recovered by hand during the excavation. Admittedly, there is a danger that this collection procedure may have missed many of the smaller sized animal bones (Levitan 1982, Payne 1975). This problem was partly overcome by dry sieving, using 0.5 cm mesh hand-held metal sieves to recover the smaller bone fragments. However, it proved impractical to sieve all contexts so this procedure was limited largely to contexts considered to be of particular importance, such as floor levels, primary pit-fills and ditch-fills. It is estimated that these sieved deposits comprise about 10% of the total number of excavated contexts. Unfortunately, it also proved impractical to separate the material recovered in this way from that picked up by hand which means that it is not possible to demonstrate if the different recovery methods did affect the overall composition of data. Even so, another control was applied in the collection of vertebrate faunal remains by taking bulk sediment samples (see below, Parfitt, p. 199 and Buysee, p. 260). These samples were floated first for archaeobotanical remains, then the residues were wet-sieved to 500 microns. This material was then sorted to recover all the smaller bone fragments which would have otherwise been missed. A total of 310 samples, representing 4,426 litres of sediment, were taken and processed during the course of the excavation programme.

The author was responsible for the processing of most of the mammalian bones on-site in Bulgaria,

using a comparative collection of modern skeletal material from the village of Nikiup. Valuable assistance in the recording of the assemblage was provided during the 1990 season by Graeham Mounteney (formerly of the Department of Archaeology and Prehistory, University of Sheffield). The identification of problematic specimens was facilitated by access to the osteological reference collections in the National Natural History Museum in Sofia. Some specimens were also compared with reference material held in the zooarchaeology laboratory collections of the Department of Archaeology and Prehistory, University of Sheffield.

All of the Nicopolis bones described in this report are currently held in store at the excavation base in Nikiup (known as the 'lager') and are registered as part of the collections of the Veliko Turnovo Historical Museum. All the boxes are coded 'NIC' with the season of excavation, followed by a description of the particular period/contexts represented.

The large mammal remains were recorded using a numerical coding system. Data was initially hand written on coding sheets and the data then transferred onto computer. This was stored as an MS-DOS file in ASCII format (23 digits wide, total 10,778 records). Sorting and quantification of the bones was carried out with the help of SPSS/PC+ – The Statistical Package for IBM PC (1993), using the tables function. Copies of all relevant data records (including a photocopy of the original hand coded sheets, a digital copy of the Nicopolis bone data file in ASCII format, all computer print-outs and a copy of this report) have been deposited in the Institute of Archaeology, Sofia and the Department of Archaeology, University of Nottingham. A full copy of the data is also lodged with the Arts and Humanities Data Service in York (see above, p. vii).

Identifiable bones were recorded to the level of the part of the anatomical element of the species. This quantification system employed a modified version of the 'fragments method,' but closer in practice to the system of 'diagnostic zones' as described by Watson (1979). An attempt was made to estimate the 'minimum number of anatomical units' (Halstead 1985), using the following elements: horncore/antler (main beam), maxilla and mandible (cheek tooth row), skull (occipital condyles only), atlas, axis, cervical, thoracic, lumbar and sacral vertebrae (centrum), ribs (proximal), scapula (glenoid), humerus and radius (proximal and distal), ulna (proximal), metacarpal (proximal and distal), pelvis (acetabular region), femur, tibia and metatarsal (proximal and distal), astragalus, calcaneus (proximal), phalanges 1, 2 and 3 (proximal).

In order to minimise the effects of bias due to fragmentation during excavation, wherever possible modern breaks to the bones from the same context were noted and the pieces were reassembled. The raw counts of pig 3rd and 4th metapodials were divided by two, and all the raw counts of phalanges of the major domestic species (cattle, pig and sheep) were divided by 4, in order to make the data for these elements comparable with other anatomical units. The MNI, or minimum number of individuals, was calculated based on the most numerous non-reproducible elements with no reconstruction for pairs. MNI were calculated using the period date as the unit of aggregation. This method of quantification has several advantages. In particular, it reduces the chance of counting the same bone twice, and it takes account of the effect of butchery practices (eg, portions of half bones). It also produces figures which can be used, with relative ease, by other statistical methods.

An attempt was made to discriminate between sheep and goat by applying the osteological differences described by Boessneck (1969) and the method developed by Payne (1985), following which morphological differences can be seen in the lower second and third milk molar teeth. The majority of those bones, which could be identified as being sheep or goat, proved to be sheep. Accordingly, it is probable that most of the finds were not goat although, in this report, the term 'sheep' is still used to refer to ovicaprid remains in general because a small quantity of the material may include goat. Ageing of the animal bones, using epiphyseal fusion data, has been applied to cattle, pig and sheep using the basic fusion groups defined by Silver (1969). Dental ageing was carried out for cattle, pig and sheep using mandible age groups based on tooth wear and attrition, after O'Connor (1991). Data relating to sexing was noted for cattle pelves, following Grigson (1982), for sheep pelves according to Boessneck (1969) and for pig canines after Schmid (1972). Butchery, pathological, non-metrical trait and biometrical data were also noted for the whole assemblage.

All the above data was recorded within each archaeologically defined context. The selection of contexts containing bones suitable for analysis was based on archaeological information provided by the excavation director, Andrew Poulter, and the site ceramic specialist, Rob Faulkner. Material was used only if it came from contexts which were stratigraphically reliable and could be accurately dated. The mammal bones were assigned to one of the following periods (all dates AD).

PERIOD	DATE	DESCRIPTION	AREA
1	100–175	early Roman	A, B, C, D, P
2	175–250	mid Roman	A, B, C, D, M, P
3	250–450	late Roman	B, C, D, E, F, K, M, P, R, S
4	450–600	early Byzantine	A, B, D, E, F, K, P, R, S
5	800–1000	Slav	K
6	1750–1850	post-medieval	C, D, F, K, M, R

All the data is summarised in Figures 10.1–10.7, Tables 10.1–10.24 and in Appendix 10.1 (biometric data).

Results

A total of 8,022 bone fragments was identified to the level of species (Table 10.1), comprising domestic mammals (camel, horse, donkey, cattle, pig, sheep, goat, dog and cat) and wild species (red deer, roe deer, brown bear, wild boar, badger, fox, beaver, ?polecat and hare). The proportion of domestic to wild animals is 97.9%: 2.1% using diagnostic zone fragments, or 94.2%: 5.8% using the MNI counts (Table 10.2). This dominance of domestic material clearly indicates that hunting of large wild mammals was of no great importance. An interesting discovery, apart from the mammalian remains, was the almost complete carapace of a tortoise. This will be included in the following report and the significance of the find will be discussed.

Figure 10.1 illustrates the relative proportions of the major domestic species by chronological period. During the early Roman period (100–175), diagnostic zone fragments suggest that there were broadly similar amounts of pig and sheep/goat, closely followed by cattle. Using MNI counts, sheep/goat appear most numerous, closely followed by pig and then cattle. From the mid Roman to early Byzantine periods (175–600) pig bones dominate, followed by sheep/goat then cattle, using both diagnostic fragment and MNI counts. The size of the assemblage recovered from the Slav period (800–1000) is too small a sample from which to draw any general deductions. Pig bones again dominated during the post-medieval period (1750–1850), followed by cattle then sheep/goat according to diagnostic fragment counts and with mostly pig, sheep/goat then cattle according to MNI counts. There appears to be a fairly normal relationship between the two methods of quantification, ie, higher numbers of pigs and sheep for MNI than in diagnostic zone fragment (DZF) counts and a decrease in the amount of cattle for MNI in comparison with DZF counts. Such variations almost certainly reflect the different processing and butchery processes. In particular, larger cattle carcasses generally end up being more fragmented. The most important change in animal husbandry practices during the full period of occupation is the increase in the frequency of pigs and an apparent decrease in the number of cattle (in both DZF and MNI counts). The proportion of sheep/goat stays at broadly a similar level with only minor fluctuations. All other domestic and wild species were represented in consistently small proportions throughout all the main periods, usually never rising above more than a few per cent of the total number of identified specimens.

One of the problems with comparing the material between the different periods, however, is the variation in sample size. The majority of the bones (88%) belong to the late Roman (250–450) and early Byzantine (450–600) periods. A further difficulty arises in comparing the intra-site variability in the distribution of the bone assemblage (Tables 10.3–8). Some areas produced only a small number of finds. If we only consider areas with more than 100 fragments identifiable to species, the general

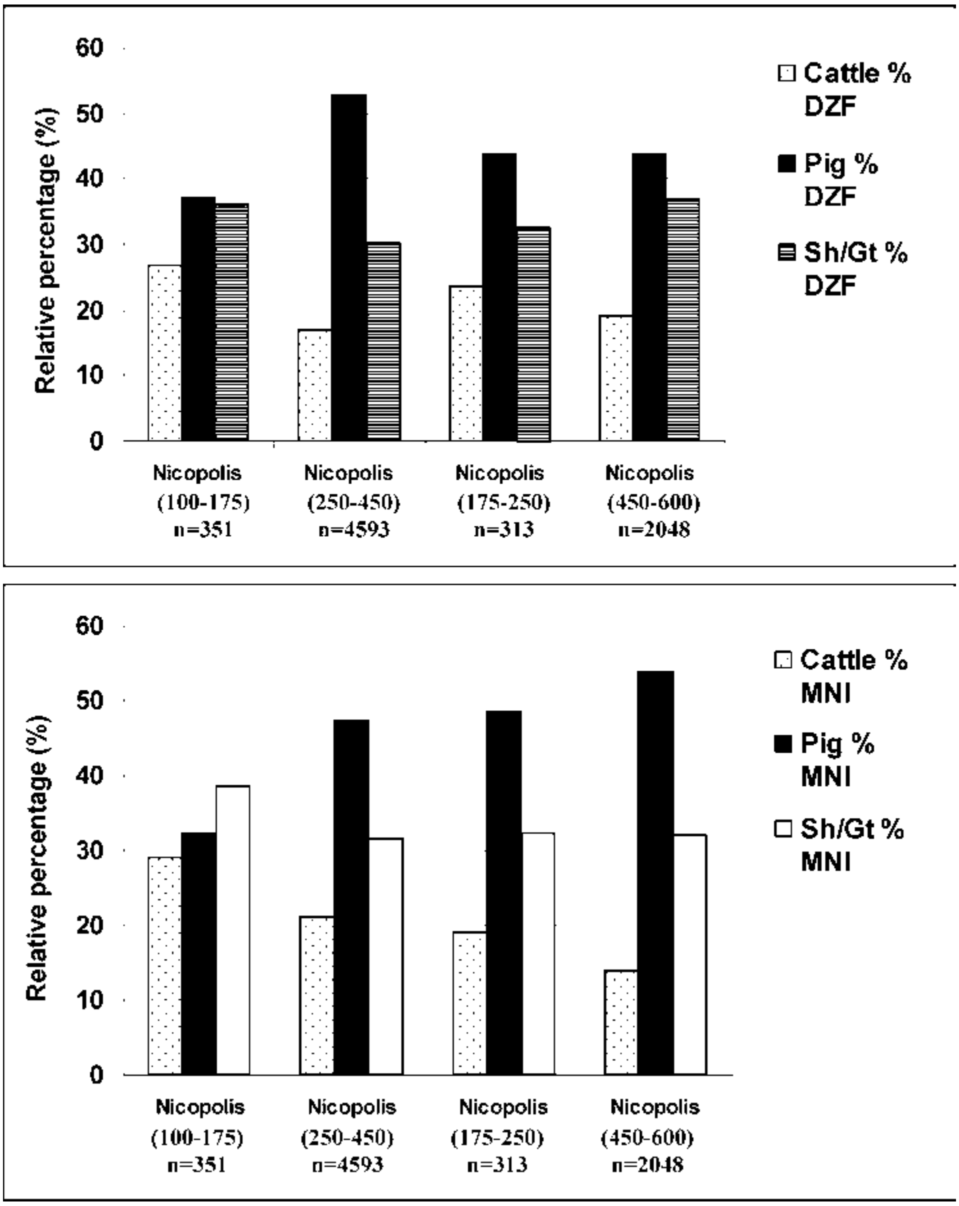


Fig 10.1 Quantification of the major domestic species at Nicopolis by diagnostic zone fragments (DZF) and minimum number of individuals (MNI)

picture described above for the major species is repeated in the breakdown from each of the areas, ie, pigs generally predominated, followed by sheep/goat then cattle. However, there were some exceptions. During the late Roman period (250–450), Area B produced large amounts of cattle bones from the primary cobbled surface (249 and 250), used to reinstate the road leading out of the Roman city (Poulter 1995, 74–6), as well as from the later resurfacing of the road with more cobbles (213, 241, 243–4 and 247–8). A complete range of anatomical elements was recorded, suggesting that cattle were probably brought to the site 'on the hoof' before being slaughtered in this area, just outside the city's southern gate. Many of the cattle bone fragments had clearly been butchered; signs of cuts and chops on their surfaces indicated basic dismemberment of carcasses. A considerable quantity of smashed skull, mandible, limb bone and phalange fragments were present in these deposits. Such remains could have been refuse which was brought in and used as make-up to resurface the road but it seems most likely that the slaughtering and primary butchery of cattle took place in, or very close to, this area.

Area D produced a large number of bones from late Roman deposits, mostly sheep/goat, followed by pig then cattle (Table 10.5). Again, the full range of anatomical elements was represented, suggesting

Table 10.1 Quantification by DZF (diagnostic zone fragments) of the identifiable animal bone fragments at Nicopolis ad Istrum by period

PHASE	**1**		**2**		**3**		**4**		**5**		**6**	
DATE	**100-175**		**175-250**		**250-450**		**450-600**		**800-1000**		**1750-1850**	
PERIOD	**Early Roman DZF**	**%**	**Mid Roman DZF**	**%**	**Late Roman DZF**	**%**	**Early Byzantine DZF**	**%**	**Slav DZF**	**%**	**Post-Medieval DZF**	**%**
Mammalia, Domestic												
Camel (*Camelus* sp.)	-		-		1	+	1	+	-		-	
Horse (*Equus caballus* L.)	9	2.5	5	1.5	98	2.0	53	2.4	-		9	3.3
Ass (*Equus asinus* L.)	1	+	-		4	+	1	+	-		-	
Cattle (*Bos taurus* L.)	94	25.7	53	16.1	1090	22.5	394	18.0	7	58.3	69	25.1
Pig (*Sus domesticus* Erxl.)	130	35.5	165	50.1	2008	41.4	896	40.9	3	25.0	100	36.4
Sheep/Goat (Caprinae)	115	34.7	87	28.9	1385	30.8	678	34.6	1	16.7	51	20.4
Sheep (*Ovies aries* L.)	10		6		90		71		1		1	
Goat (*Capra hircus* L.)	2		2		20		9		-		4	
Dog (*Canis familaris* L.)	1	+	3	+	48	+	44	2.0	-		12	4.4
Cat (*Felis domestica* Schreb.)	-		1	+	17*	+	6	+	-		-	
Total Mammalia, Domestic	**362**		**322**		**4761**		**2153**		**12**		**246**	
Mammalia, Wild												
Red Deer (*Cervus elaphus* L.)	2	+	2	+	8	+	19	+	-		2	+
Roe Deer (*Capreolus capreolus* L.)	-		-		-		2	+	-		1	+
Brown Bear (*Ursus arctos* L.)	-		-		1	+	1	+	-		-	
Wild Boar (*Sus scrofa* L.)	-		1	+	9	+	4	+	-		-	
Badger (*Meles meles* L.)	-		-		1	+	-		-		2	+
Fox (*Vulpes vulpes* L.)	-		-		1	+	-		-		-	
Beaver (*Castor fiber* L.)	-		-		1	+	2	+	-		3	1.1
Mustelidae, Indeterminate	-		-		5	+	-		-		1	+
Hare (*Lepus europaeus* Pall.)	2	+	4	1.2	58	1.2	12	+	-		20	7.3
Total Mammalia, Wild	**4**		**7**		**84**		**40**		**0**		**29**	
Reptilia												
Tortoise (*Testudo graeca* L.)	-		-		**2**	+	-		-		-	
GRAND TOTAL	**366**		**329**		**4847**		**2193**		**12**		**275**	

+ = less than 1%   * = includes partial skeleton (N=7)

that complete carcasses had been processed in this part of the site. One explanation for the unusually high proportion of sheep/goat may be that these particular contexts represent household waste rather than primary butchery waste. Most belonged to the construction and occupation surfaces of the 'early building,' probably store rooms or workshops (Poulter 1995, 116–120). Many of the bones bore the signs of dismemberment, and some had traces of burning on their surfaces. This domestic kitchen rubbish contrasts with the primary butchery waste found in area B. The bones may have been casually disposed of within and around the site of the 'early building', before becoming incorporated into its occupation surfaces.

Preservation and Taphonomy

Most of the mammalian bone material recovered comprised butchery or kitchen refuse. No complete skeletons were found and very few examples of partially articulated limbs. Most long bones were heavily fragmented, presumably because they were regularly broken up so as to allow the extraction of marrow, and skulls were also split or smashed, no doubt to remove the brains (cf, discussion of butchery below). Many of the bones showed traces of burning and carnivore gnawing, as would be expected in general settlement debris.

Carnivore damage, in the form of characteristic puncture marks and gnawing, was observed on the

Table 10.2 Quantification by MNI (minimum number of individuals) of the identifiable animal bone fragments at Nicopolis ad Istrum by period

PERIOD	**1**		**2**		**3**		**4**		**5**		**6**	
DATE	**100-175**		**175-250**		**250-450**		**450-600**		**800-1000**		**1750-1850**	
PERIOD	**Early Roman**		**Mid Roman**		**Late Roman**		**Early Byzantine**		**Slav**		**Post-Medieval**	
	MNI	**%**	**MNI**	**%**	**MNI**	**%**	**MNI**	**%**	**MNI**	**%**	**MNI**	**%**
Mammalia, Domestic												
Camel (*Camelus* sp.)	-		-		1	+	1	+	-		-	
Horse (*Equus caballus* L.)	1	2.8	1	2.1	2	+	3	1.4	-		1	1.9
Ass (*Equus asinus* L.)	1	2.8	-		1	+	1	+	-		-	
Cattle (*Bos taurus* L.)	9	25.0	8	16.6	62	17.7	28	12.7	1	33.3	7	13.2
Pig (*Sus domesticus* Erxl.)	10	27.7	18	37.5	158	45.1	109	49.5	1	33.3	20	37.7
Sheep/Goat (Caprinae)	12	33.3	12	25.0	105	30.0	65	29.5	1	33.3	15	28.3
Dog (*Canis familaris* L.)	1	2.8	1	2.1	2	+	2	+	-		1	1.9
Cat (*Felis domestica* Schreb.)	-		1	2.1	2	+	1	+	-		-	
Total Mammalia, Domestic	**34**		**41**		**333**		**210**		**3**		**44**	
Mammalia, Wild												
Red Deer (*Cervus elaphus* L.)	1	2.8	2	4.2	1	+	4	1.8	-		1	1.9
Roe Deer (*Capreolus capreolus* L.)	-		-		-		1	+	-		1	1.9
Brown Bear (*Ursus arctos* L.)	-		-		1	+	1	+	-		-	
Wild Boar (*Sus scrofa* L.)	-		1	2.1	1	+	1	+	-		-	
Badger (*Meles meles* L.)	-		-		1	+			-		1	1.9
Fox (*Vulpes vulpes* L.)	-		-		1	+	-		-		-	
Beaver (*Castor fiber* L.)	-		-		1	+	1	+	-		1	1.9
Mustelidae, Indeterminate	-		-		1	+	-		-		1	1.9
Hare (*Lepus europaeus* Pall.)	1	2.8	4	8.3	9	2.6	2	+	-		4	7.5
Total Mammalia, Wild	**2**		**7**		**16**		**10**		**0**		**9**	
Reptilia												
Tortoise (*Testudo graeca* L.)	-		-		1	+	-		-		-	
GRAND TOTAL	**36**		**48**		**350**		**220**		**3**		**53**	

+ = less than 1%

surface of about 21% of the cattle, 27% of the pig and 29% of the sheep/goat bones. This suggests that this material was not always buried immediately after use and bones may have been left exposed on open dumps for some time. Dogs were certainly present and they no doubt account for these signs of scavenging amongst discarded food waste.

Traces of burning in the form of discolouration (black, blue, grey or white) were identified on about 9% of the cattle, 4% of the pig and 3% of the sheep/goat bones. However, this probably does not constitute reliable evidence for how meat was cooked because only those bones with clear discolouration were counted. Many of the other bone fragments had a slight greying on their surfaces, which suggests that they had also been exposed to fire, though to a lesser degree.

In terms of the effectiveness of recovery, the assemblage as a whole was carefully excavated. The incidence of new breakage to bone surfaces was generally low, being 14% on average for horse fragments, 11% for cattle and 4% for both pig and sheep/goat.

Table 10.3 Quantification by DZF (diagnostic zone fragments) of the identifiable animal bone fragments at Nicopolis ad Istrum in period 1 (100–175)

PERIOD 1 (100-175) EARLY ROMAN AREA	**A**		**B**		**C**		**D**		**P**	
	DZF	**%**	**DZF**	**%**	**DZF**	**%**	**DZF**	**%**	**DZF**	**%**
Mammalia, Domestic										
Horse (*Equus caballus* L.)	5	3.5	1	2.1	-		2	2.6	1	1.0
Ass (*Equus asinus* L.)	1	+	-		-		-		-	
Cattle (*Bos taurus* L.)	39	27.5	22	47.8	1	50.0	21	27.6	11	11.0
Pig (*Sus domesticus* Erxl.)	44	31.0	9	19.5	1	50.0	32	42.1	44	44.0
Sheep/Goat (Caprinae)	47	35.9	13	28.2	-		17	25.0	38	44.0
Sheep (*Ovies aries* L.)	4		-		-		1		5	
Goat (*Capra hircus* L.)	-		-		-		1		1	
Dog (*Canis familaris* L.)	1	+	-		-		-		-	
Total Mammalia, Domestic	**141**		**45**		**2**		**74**		**100**	
Mammalia, Wild										
Red Deer (*Cervus elaphus* L.)	-		1	2.1	-		1	1.3	-	
Hare (*Lepus europaeus* Pall.)	1	+	1	2.1	-		1	1.3	-	
Total Mammalia, Wild	**1**		**1**				**2**		**0**	
GRAND TOTAL	**142**		**46**		**2**		**76**		**100**	

Table 10.4 Quantification by DZF (diagnostic zone fragments) of the identifiable animal bone fragments at Nicopolis ad Istrum in period 2 (175–250)

PERIOD 2 (175-250) MID ROMAN AREA	**A**		**B**		**C**		**D**		**M**		**P**	
	DZF	**%**	**DZF**	**%**	**DZF**	**%**	**DZF**	**%**	**DZF**	**%**	**DZF**	**%**
Mammalia, Domestic												
Horse (*Equus caballus* L.)	-		-		2	4.7	3	1.6	-		-	
Cattle (*Bos taurus* L.)	-		8	10.0	7	16.3	33	17.2	5	41.7	-	
Pig (*Sus domesticus* Erxl.)	2	100.0	43	53.8	23	53.4	92	47.9	5	41.7	-	
Sheep/Goat (Caprinae)	-		26	35.0	8	18.6	51	29.7	2	16.6	-	
Sheep (*Ovies aries* L.)	-		-		-		6		-		-	
Goat (*Capra hircus* L.)	-		2		-		-		-		-	
Dog (*Canis familaris* L.)	-		-		-		3	1.6	-		1	100.0
Cat (*Felis domestica* Schreb.)	-		-		-		1	+	-		-	
Total Mammalia, Domestic	**2**		**79**		**40**		**189**		**12**		**1**	
Mammalia, Wild												
Red Deer (*Cervus elaphus* L.)	-		-		1	2.3	1	+	-		-	
Wild boar (*Sus scrofa* L.)	-		-		-		1	+	-		-	
Hare (*Lepus europaeus* Pall.)	-		1	1.2	2	4.7	1	+	-		-	
Total Mammalia, Wild	**0**		**1**		**3**		**3**		**0**		**0**	
GRAND TOTAL	**2**		**80**		**43**		**192**		**12**		**1**	

Table 10.5 Quantification by DZF (diagnostic zone fragments) of the identifiable animal bone fragments at Nicopolis ad Istrum in period 3 (250-450)

PERIOD 3 (250-450) **LATE ROMAN** **AREA**	**B** **DZF**	**%**	**C** **DZF**	**%**	**D** **DZF**	**%**	**E** **DZF**	**%**	**F** **DZF**	**%**
Mammalia, Domestic										
Camel (*Camelus* sp.)	-		-		1	+	-		-	
Horse (*Equus caballus* L.)	35	3.8	32	3.5	8	+	1	+	6	2.1
Ass (*Equus asinus* L.)	3	+	-		-		-		-	
Cattle (*Bos taurus* L.)	374	41.2	232	25.1	178	16.5	31	12.2	75	26.8
Pig (*Sus domesticus* Erxl.)	263	29.0	388	42.0	385	35.8	118	46.3	109	38.9
Sheep/Goat (Caprinae)	217	24.4	233	26.5	448	45.0	75	35.7	74	29.3
Sheep (*Ovies aries* L.)	5		10		31		11		7	
Goat (*Capra hircus* L.)	-		2		5		5		1	
Dog (*Canis familaris* L.)	1	+	14	1.5	10	+	1	+	2	+
Cat (Felis domestica Schreb.)	1	+	9	1.0	-		7*	+	-	
Total Mammalia, Domestic	**899**		**910**		**1066**		**249**		**274**	
Mammalia, Wild										
Red Deer (*Cervus elaphus* L.)	4	+	2	+	-		1	+	-	
Brown Bear (*Ursus arctos* L.)	1	+	-		-		-		-	
Wild Boar (*Sus scrofa* L.)	-		4	+	1	+	-		-	
Beaver (*Castor fiber* L.)	1	+	-		-		-		-	
Mustelidae, Indeterminate	-		-		-		1	+	1	+
Hare (*Lepus europaeus* Pall.)	2	+	7	+	9	+	4	+	5	1.8
Total Mammalia, Wild	**8**		**13**		**10**		**6**		**6**	
Reptilia										
Tortoise (*Testudo graeca* L.)	**1**	**+**	**-**		**-**		**-**		**-**	
GRAND TOTAL	**908**		**923**		**1076**		**255**		**280**	

PERIOD 3 (250-450) **LATE ROMAN** **AREA**	**K** **DZF**	**%**	**M** **DZF**	**%**	**P** **DZF**	**%**	**R** **DZF**	**%**	**S** **DZF**	**%**
Mammalia, Domestic										
Camel (*Camelus* sp.)	-		-		-		-		-	
Horse (*Equus caballus* L.)	3	+	-		7	+	4	1.8	2	3.9
Ass (*Equus asinus* L.)	-		-		1	+	-		-	
Cattle (*Bos taurus* L.)	49	15.6	7	12.1	102	13.4	39	17.6	3	5.9
Pig (*Sus domesticus* Erxl.)	194	62.0	16	27.6	410	53.9	100	45.2	25	49.0
Sheep/Goat (Caprinae)	39	16.6	26	55.2	190	26.7	72	33.0	21	41.2
Sheep (*Ovies aries* L.)	9		4		12		1		-	
Goat (*Capra hircus* L.)	4		2		1		-		-	
Dog (*Canis familaris* L.)	-		-		17	2.2	3	1.3	-	
Cat (Felis domestica Schreb.)	-		-		-				-	
Total Mammalia, Domestic	**298**		**55**		**740**		**219**		**51**	
Mammalia, Wild										
Red Deer (*Cervus elaphus* L.)	1	+	-		-		-		-	
Wild Boar (*Sus scrofa* L.)	1	+	-		2	+	-		-	
Badger (*Meles meles* L.)	-		-		-		1	+	-	
Fox (*Vulpes vulpes* L.)	-		-		1	+	-		-	
Mustelidae, Indeterminate	2	+	-		1	+	-		-	
Hare (*Lepus europaeus* Pall.)	11	3.5	2	3.4	16	2.1	1	+	-	
Total Mammalia, Wild	**15**		**3**		**20**		**2**		**0**	
Reptilia										
Tortoise (*Testudo graeca* L.)	**-**		**-**		**1**	**+**	**-**		**-**	
GRAND TOTAL	**313**		**58**		**761**		**221**		**51**	

(* = includes partial skeleton, N=7)

Table 10.6 Quantification by DZF (diagnostic zone fragments) of the identifiable animal bone fragments at Nicopolis ad Istrum in period 4 (450–600)

PERIOD 4 (450-600) EARLY BYZANTINE AREA	**A DZF**	**%**	**B DZF**	**%**	**D DZF**	**%**	**E DZF**	**%**	**F DZF**	**%**
Mammalia, Domestic										
Camel (*Camelus* sp.)	-		-		-		-		1	+
Horse (*Equus caballus* L.)	17	4.2	-		9	1.5	24	2.5	-	
Ass (*Equus asinus* L.)	-		-		1	+	-		-	
Cattle (*Bos taurus* L.)	84	20.9	-		81	13.5	159	16.6	28	23.7
Pig (*Sus domesticus* Erxl.)	168	41.9	-		244	40.8	380	39.7	52	44.1
Sheep/Goat (Caprinae)	97	27.4	-		232	41.0	298	36.2	36	30.5
Sheep (*Ovies aries* L.)	11		-		12		45		-	
Goat (*Capra hircus* L.)	2		-		1		3		-	
Dog (*Canis familaris* L.)	15	3.7	-		9	1.5	20	2.1	-	
Cat (Felis domestica Schreb.)	-		-		1	+	5	+	-	
Total Mammalia, Domestic	**394**		**-**		**590**		**934**		**117**	
Mammalia, Wild										
Red Deer (*Cervus elaphus* L.)	1	+	-		1	+	17	1.8	-	
Roe Deer (*Capreolus capreolus* L.)					2	+				
Brown Bear (Ursus arctos L.)	-		-		-		1	+	-	
Wild Boar (*Sus scrofa* L.)	2	+	-		1	+	1	+	-	
Beaver (*Castor fiber* L.)	-		1	100.0	1	+	-		-	
Mustelidae, Indeterminate	-		-		-		-		-	
Hare (*Lepus europaeus* Pall.)	4	1.0	-		3	+	3	+	1	+
Total Mammalia, Wild	**7**		**1**		**8**		**22**		**1**	
Reptilia										
Tortoise (*Testudo graeca* L.)	**-**		**-**		**-**		**-**		**-**	
GRAND TOTAL	**401**		**1**		**598**		**956**		**118**	

PERIOD 4 (450-600) EARLY BYZANTINE AREA	**K DZF**	**%**	**P DZF**	**%**	**R DZF**	**%**	**S DZF**	**%**
Mammalia, Domestic								
Camel (*Camelus* sp.)	-		-		-		-	
Horse (*Equus caballus* L.)	3	3.4	-		-		-	
Ass (*Equus asinus* L.)	-		-		-		-	
Cattle (*Bos taurus* L.)	33	37.5	2	25.0	-		7	36.8
Pig (*Sus domesticus* Erxl.)	38	43.2	4	50.0	2	50.0	8	42.1
Sheep/Goat (Caprinae)	8	15.9	2	25.0	2	50.0	3	15.8
Sheep (*Ovies aries* L.)	3		-		-		-	
Goat (*Capra hircus* L.)	3		-		-		-	
Dog (*Canis familaris* L.)	-		-		-		-	
Cat (Felis domestica Schreb.)	-		-				-	
Total Mammalia, Domestic	**88**		**8**		**4**		**18**	
Mammalia, Wild								
Red Deer (*Cervus elaphus* L.)	-		-		-		-	
Wild Boar (*Sus scrofa* L.)	-		-		-		-	
Badger (*Meles meles* L.)	-		-		-		-	
Fox (*Vulpes vulpes* L.)	-		-		-		-	
Mustelidae, Indeterminate	-		-		-		-	
Hare (*Lepus europaeus* Pall.)	-		-		-		1	5.3
Total Mammalia, Wild	**0**		**0**		**0**		**1**	
Reptilia								
Tortoise (*Testudo graeca* L.)	**-**		**-**		**-**		**-**	
GRAND TOTAL	**88**		**8**		**4**		**19**	

Table 10.7 Quantification by DZF (diagnostic zone fragments) of the identifiable animal bone fragments at Nicopolis ad Istrum in period 5 (800–1000)

PERIOD 5 (800-1000) **SLAV** **AREA**	**K** **DZF**	**%**
Mammalia, Domestic		
Cattle (*Bos taurus* L.)	7	58.3
Pig (*Sus domesticus* Erxl.)	3	25.0
Sheep/Goat (Caprinae)	1	8.3
Sheep (*Ovies aries* L.)	1	8.3
Total Mammalia, Domestic	**12**	
GRAND TOTAL	**12**	

Table 10.8 Quantification by DZF (diagnostic zone fragments) of the identifiable animal bone fragments at Nicopolis ad Istrum in period 6 (1750–1850)

PERIOD 6 (1750-1850) **POST-MEDIEVAL** **AREA**	**C** **DZF**	**%**	**D** **DZF**	**%**	**F** **DZF**	**%**	**K** **DZF**	**%**	**M** **DZF**	**%**	**R** **DZF**	**%**
Mammalia, Domestic												
Horse (*Equus caballus* L.)	4	3.4	4	3.7	-		1	3.0	-		-	
Cattle (*Bos taurus* L.)	33	28.0	31	28.9	-		5	15.1	-		-	
Pig (*Sus domesticus* Erxl.)	52	44.1	37	34.6	-		8	24.2	-		3	100.0
Sheep/Goat (Caprinae)	24	20.3	24	26.2	-		3	12.1	-		-	
Sheep (*Ovies aries* L.)	-		1		-		-		-		-	
Goat (*Capra hircus* L.)	-		3		-		1		-		-	
Dog (*Canis familaris* L.)	2	1.7	2	1.9	3	37.5	2	6.1	3	50.0	-	
Total Mammalia, Domestic	**115**		**102**		**3**		**20**		**3**		**3**	
Mammalia, Wild												
Red Deer (*Cervus elaphus* L.)	-		2	1.9	-		-		-		-	
Roe deer (*Capreolus capreolus* L.)	1	+	-		-		-		-		-	
Badger (*Meles meles* L.)	2	1.7	-		-		-		-		-	
Beaver (*Castor fiber* L.)	-		-		1	12.5	1	3.0	1	16.7		
Mustelidae, Indeterminate	-		-		-		1	3.0	-		-	
Hare (*Lepus europaeus* Pall.)	-		3	2.8	4	50.0	11	33.3	2	33.3	-	
Total Mammalia, Wild	**3**		**5**		**5**		**13**		**3**		**0**	
GRAND TOTAL	**118**		**107**		**8**		**33**		**6**		**3**	

Anatomical Representation

The anatomical representation of the major species was examined for each period (Tables 10.9–11). To evaluate the relative proportions of particular groups of elements, the counts of non-reproducible elements were also quantified into carcass components (Table 10.12).

Examination of the data as a whole provides valuable information about the taphonomic factors which affected the composition of the assemblage, even though explaining this evidence is not always straightforward. The relatively low numbers of phalanges recovered for the smaller-sized animals, such as pig and sheep, may be because not all deposits were sieved (cf, Levitan 1982, Payne 1975). However, scavenging by carnivores, after disposal of the bone refuse, could equally account for the absence of the smaller bones. Also, the typically high proportion of mandibles and distal, rather than proximal, humeri and tibiae, could be explained, to some extent, by carnivore activity since the under-represented elements are more friable and less likely to be preserved than those which are well represented in the assemblage.

DOMESTIC FAUNA

CATTLE

No skeletons or clear cases of articulated cattle limbs were found. Even so, the fact that a wide range of elements is recorded does suggest that animals were brought to the site 'on the hoof.' Most bone fragments identified belonged to the major limb bones. These largely represented waste from the meat bearing joints.

There were surprisingly low numbers of cattle horn cores in proportion to the other elements (Table 10.9). This may indicate that horn working and processing was carried out close to the areas excavated. Evidence for this is provided by the collection of horncores from butchered cattle and sheep from the primary fill of the drain under the early Byzantine gate in area E (1088) and in the discovery, more generally, of worked and partially worked bone in other areas (see worked bone report, p. 79). Note that context 1088 in area E also produced five cattle thoracic vertebrae from the same individual (see below, pathology, p. 175).

Generally, few cattle mandibles and maxillae were found which suggests that, as a rule, with the exception of the cobbled surface in area B, the slaughtering of animals and the primary butchery of carcasses to provide joints of meat were activities which did not take place in or close to the areas excavated.

There did not appear to be particular concentrations of any other anatomical elements, although metapodials were generally well-represented. This may be because these bones are robust and survive better than other elements, although it could be that these were collected as raw material for making bone implements (see above, p. 79).

PIG

Three deposits contained the remains of partial skeletons or articulated limbs. Two contexts, dated to the late Roman period, contained such material. Area E, context 1191, included a partial forelimb of

Table 10.9 Cattle anatomical representation

PERIOD	**1**	**2**	**3**	**4**	**5**	**6**
DATE	**100-175**	**175-250**	**250-450**	**450-600**	**800-1000**	**1750-1850**
PERIOD	**Early Roman**	**Mid Roman**	**Late Roman**	**Early Byzantine**	**Slav**	**Post-Medieval**
Horncore	-	2	13	14	-	2
Skull, occipital condyle	3	2	9	6	-	2
Maxilla	1	1	12	6	1	-
Mandible	9	1	27	17	1	-
Atlas	2	-	10	4	-	1
Axis	-	-	11	4	-	1
Scapula, distal	4	3	47	17	1	2
Humerus, proximal	-	-	13	5	-	-
Humerus, distal	-	-	49	24	-	7
Radius, proximal	2	8	40	13	-	3
Radius, distal	3	-	12	10	-	3
Ulna proximal	2	-	11	9	-	3
Metacarpal, proximal	4	1	39	14	1	3
Metacarpal, distal	4	3	19	6	-	3
Pelvis acetabulum	6	1	51	27	-	3
Femur, proximal	-	2	16	10	-	1
Femur, distal	1	1	17	12	-	-
Tibia, proximal	6	3	16	14	-	-
Tibia, distal	4	2	25	14	-	2
Metatarsal, proximal	2	6	62	19	-	2
Metatarsal, distal	3	2	59	28	-	2
Astragalus	2	2	37	14	-	1
Calcaneum	4	-	35	23	1	4
Phalanx 1	3	3	38	12	-	2
Phalanx 2	2	2	28	9	1	1
Phalanx 3	1	2	11	3	-	1

Note that the figures are obtained from counts of non-reproducible elements, and do not necessarily correspond with total DZF counts in tables 1–2. The totals of all phalanges have been divided by four, to allow comparisons with other anatomical units.

a neonatal individual. This comprised a radius, ulna, third and fourth metacarpals. In addition, the partial skeleton of an immature individual was identified in area K (4516). This find comprised a pair of humeri, left radius and pair of ulnae (all with unfused proximal and distal epiphyses), a left pelvis (unfused), right tibia (unfused proximal and distal epiphysis), and a distal metapodial (unfused). An early Byzantine context produced an articulated hind-limb of an immature individual. Area E, context 1034, contained a distal tibia (fused epiphysis), a distal fibula, astragalus and calcaneus (unfused proximal epiphysis). These three deposits suggest that pig breeding was carried out at Nicopolis (see also below, ageing data). Moreover, stillborn individuals were also occasionally represented, which can be taken as clear evidence that pigs must have been reared in, or just outside, the city. All major body elements were represented which indicates that these animals were also slaughtered at Nicopolis. The high numbers of mandibles found represent the disposal of waste from the primary butchery of carcasses. The relatively low quantities of maxillae to mandibles recovered may be the result of butchery practices; if the skulls were usually split and smashed open to extract the brain, this would have damaged the maxillae and account for their under-representation in the assemblage as a whole.

The representation of carcass components is, for the most part, the same for all periods of occupation. There does not seem to be any general concentration of particular anatomical units although, when the elements are compared by period (Table 10.10), there are clearly disproportionate numbers of scapula, distal humeri and pelves from late Roman contexts. Perhaps, during this period, the preparation of joints of salted or smoked ham was of particular importance.

SHEEP

Only a single sheep skeleton was found. This was the partial skeleton of a neonatal lamb. It came from an early Roman pit-fill in area A (2277). The stillborn individual was represented by a pair of scapulae, humeri, radii and left ulna, metacarpal, pair of pelves, pair of metatarsals, calcaneus, first, second and third phalanges.

Table 10.10 Pig anatomical representation

PERIOD **DATE** **PERIOD**	**1** **100-175** **Early Roman**	**2** **175-250** **Mid Roman**	**3** **250-450** **Late Roman**	**4** **450-600** **Early Byzantine**	**5** **800-1000** **Slav**	**6** **1750-1850** **Post-Medieval**
Skull, occipital condyle	4	-	23	10	-	2
Maxilla	1	8	93	77	-	6
Mandible	10	13	180	109	-	20
Atlas	-	1	25	22	-	1
Axis	-	-	6	1	-	1
Scapula, distal	5	13	123	65	-	5
Humerus, proximal	5	6	47	28	-	2
Humerus, distal	4	15	158	72	-	18
Radius, proximal	5	4	65	24	-	2
Radius, distal	3	1	36	17	-	3
Ulna proximal	6	18	98	44	-	5
Metacarpals 3+4, proximal	5	11	61	44	1	2
Metacarpals 3+4, distal	3	9	46	32	1	2
Pelvis acetabulum	5	18	106	43	-	7
Femur, proximal	-	6	59	18	-	1
Femur, distal	-	6	75	36	-	4
Tibia, proximal	3	13	57	27	1	1
Tibia, distal	6	6	74	33	1	3
Metatarsals 3+4, proximal	4	4	41	28	1	2
Metatarsals 3+4, distal	3	4	24	16	1	1
Astragalus	1	1	45	14	-	2
Calcaneum	1	10	70	36	-	5
Phalanx 1	1	2	26	12	-	-
Phalanx 2	1	1	13	7	-	1
Phalanx 3	-	1	5	4	-	1

Note that the figures are obtained from counts of non-reproducible elements, and do not necessarily correspond with total DZF counts in tables 1–2. The totals of all third and fourth metapodials have been divided by two, and phalanges have been divided by four, to allow comparisons with other anatomical units.

Table 10.11 Sheep/goat anatomical representation

PERIOD	**1**	**2**	**3**	**4**	**5**	**6**
DATE	**100-175**	**175-250**	**250-450**	**450-600**	**800-1000**	**1750-1850**
PERIOD	**Early Roman**	**Mid Roman**	**Late Roman**	**Early Byzantine**	**Slav**	**Post-Medieval**
Horncore	1	-	31	14	-	1
Skull, occipital condyle	1	-	5	6	-	-
Maxilla	-	2	27	32	-	2
Mandible	7	7	76	65	-	15
Atlas	-	2	13	8	-	1
Axis	1	3	14	3	-	1
Scapula, distal	6	7	77	30	-	-
Humerus, proximal	8	4	35	20	-	-
Humerus, distal	12	11	103	61	-	5
Radius, proximal	12	12	105	58	-	6
Radius, distal	9	12	79	39	-	2
Ulna proximal	4	6	28	17	-	2
Metacarpal, proximal	1	5	59	36	-	-
Metacarpal, distal	1	6	43	24	-	2
Pelvis acetabulum	5	9	91	32	1	4
Femur, proximal	1	6	24	14	-	2
Femur, distal	2	3	20	10	-	1
Tibia, proximal	9	5	49	30	-	3
Tibia, distal	11	8	102	59	-	8
Metatarsal, proximal	6	9	79	50	1	1
Metatarsal, distal	4	3	59	26	1	-
Astragalus	1	3	51	16	-	1
Calcaneum	1	1	31	22	-	-
Phalanx 1	1	2	20	10	-	1
Phalanx 2	1	1	6	4	-	-
Phalanx 3	1	1	5	4	-	-

Note that the figures are obtained from counts of non-reproducible elements, and do not necessarily correspond with total DZF counts in Tables 10.1–2. The totals of all phalanges have been divided by four, to allow comparisons with other anatomical units.

Table 10.12 Abundance of carcass components

PERIOD	**1**		**2**		**3**		**4**		**5**		**6**	
DATE	**100-175**		**175-250**		**250-450**		**450-600**		**800-1000**		**1750-1850**	
PERIOD	**Early Roman**		**Mid Roman**		**Late Roman**		**Early Byzantine**		**Slav**		**Post-Medieval**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
CATTLE												
Horncores	-	-	2	4.7	13	2.0	14	4.6	-	-	2	4.5
Maxilla/Mandible	10	15.9	2	4.7	39	6.0	23	7.5	2	33.3	-	-
Scapula/Pelvis	10	15.9	4	9.3	98	15.1	44	14.4	1	16.6	5	11.4
Forelimb	7	11.1	8	18.6	112	17.3	56	18.4	-	-	16	36.4
Hindlimb	17	27.0	8	18.6	130	20.1	77	25.2	1	16.6	7	15.9
Metapodial	13	20.6	12	27.9	179	27.6	67	22.0	1	16.6	10	22.7
Phalanges	6	9.5	7	16.2	77	11.9	24	7.9	1	16.6	4	9.1
PIG												
Maxilla/Mandible	11	16.9	21	13.6	273	20.2	186	25.9	-	-	26	29.5
Scapula/Pelvis	10	15.4	31	20.1	229	16.9	108	15.1	-	-	12	13.6
Forelimb	18	27.7	38	24.7	357	26.4	157	21.9	-	-	28	31.8
Hindlimb	11	16.9	36	23.4	321	23.7	146	20.4	2	33.3	15	17.0
Metapodial 3+4	15	23.1	28	18.2	172	12.7	120	16.7	4	66.7	7	8.0
SHEEP/GOAT												
Horncores	1	1.0	-	-	31	2.7	14	2.2	-	-	1	1.8
Maxilla/Mandible	7	7.3	9	7.9	103	9.0	97	15.2	-	-	17	31.5
Scapula/Pelvis	11	11.5	16	14.2	168	14.7	62	9.7	1	33.3	4	7.4
Forelimb	37	38.5	41	36.3	315	27.6	175	27.4	-	-	15	27.8
Hindlimb	24	25.0	20	17.7	253	22.2	137	21.4	-	-	13	24.1
Metapodial	12	12.5	23	20.4	240	21.0	136	21.3	2	66.7	3	5.6
Phalanges	4	4.2	4	3.5	31	2.7	18	2.8	-	-	1	1.8

Note that the figures are obtained from counts of non-reproducible elements, not counts from fragments. Only the glenoids are counted for scapulae, and the acetabulae for pelves. Forelimb includes: distal humerus, proximal and distal radius, and ulna. Hindlimb includes: distal femur, proximal and distal tibia, astragalus and calcaneum. All figures in brackets are percentages.

The anatomical representation data for sheep (Table 10.11) demonstrates that all major body elements were identified. Probably, as with cattle, the animals were brought to the site 'on the hoof' for subsequent slaughter and butchery. Just as with cattle, relatively few horncores were found, which suggests that they were removed for use in the manufacture of bone objects. A collection of butchered ram horncores came from the primary fill of the drain under the early Byzantine gate in area E (1088), the same context which produced the butchered horncores of cattle, noted above.

Mandibles were quite well represented but maxillae less so, probably, as noted for pigs, because of the method of butchery used. Other elements were found in normal proportions, although there seems to be disproportionate quantities of distal humeri, proximal radii, pelves and distal tibia in late Roman deposits. This may be explained by taphonomic factors, especially by the fact that these harder, more compact elements are less prone to damage by carnivore gnawing and fragmentation. The elbow and hind-limb joints, however, are where the main meat joints are found, so their relative abundance in the assemblage is not surprising. Metapodials were generally well represented and appear to have been sometimes used for bone working to produce tools (see above, worked bone, p. 79). Phalanges were present in low numbers which could be due to a combination of factors such as poor recovery and carnivore action although it is surprising that the sieving and sampling carried out during the excavation failed to produce more examples, particularly since numerous small bones of birds, fish and small mammals were recovered by the bulk processing of sediment samples. Perhaps, therefore, the under-representation of phalanges is significant. One explanation might be that the initial slaughtering and primary butchery of sheep was carried out outside the areas examined by excavation. This might also explain why so few horncores have been found because they may have been removed when the animals were skinned.

Ageing

Two approaches were used to investigate the age of the major domestic species; dental eruption and wear, as well as epiphyseal fusion data. Dental ageing data for the major domestic species are presented in Tables 10.13–15. Epiphyseal fusion data are in Tables 10.16–18.

Dental Data

In the case of cattle, most periods produced too few samples to permit detailed evaluation of the age structure (Table 10.13). Such evidence as there is suggests that most were killed at a mature adult age (ie, at adult stage 'C', the third permanent molar having dentine exposure on its distal column). During the late Roman period cattle were killed over a wide age range, varying from juvenile/immature up to mature adult. This was also the case in the early Byzantine period. The youngest individuals would have probably only just been weaned, whilst those of the 'sub-adult' to 'adult A' stage would have been between eighteen months and three and a half years old. Animals of 'adult B' stage or older were probably aged from about four to eight or nine years old. No neonatal individuals were identified although their absence may be partly due to the taphonomic factors mentioned above, as well as biases linked to the hand recovery of the bulk of the material. Because breeding livestock inevitably does result in some natural infant mortality and involves deliberate culling as part of herd management, the absence of young calves suggests that the inhabitants were consumers and not engaged in breeding livestock. However, the older cattle represented in the assemblage had probably been kept as dairy cows or perhaps as plough oxen. The younger animals were probably slaughtered to provide veal.

Pig dental data were also relatively poor for the late Roman and early Byzantine periods (Table 10.14). Generally, pigs were killed at a broad age range varying from juvenile to mature adult. Most animals were slaughtered, however, before attaining adulthood. During the late Roman period, the majority of pigs were killed at the following ages; 'juvenile' (lower first permanent molar not in wear) to 'immature' (lower second permanent molar not in wear), 'sub-adult A' (lower third permanent molar present in crypt) and 'adult A/B' (lower third permanent molar with enamel attrition only or minor dentine exposure). In the early Byzantine period, a similar slaughter pattern prevailed; animals were killed when juvenile/immature and at a 'sub-adult A' stage. The only observable difference was

Table 10.13 Cattle dental data

PERIOD	Neonat.	Juven.	Imm.	Subad. A	Subad. B	Adult A	Adult B	Adult C	Elderly
100-175 EARLY ROMAN	-	-	-	-	-	-	-	5	-
175-250 MID ROMAN	-	-	-	-	-	-	-	1	-
250-450 LATE ROMAN	-	1	2	-	2	4	4	18	-
450-600 EARLY BYZANTINE	-	-	1	-	2	1	1	6	-
800-1000 SLAV	-	-	-	-	-	-	1	-	-
1750-1850 POST-MEDIEVAL	-	-	-	-	-	-	1	2	-

Definition of age periods (A.P.):

Neonat. = Neonatal
Juven. = Juvenile: LM1 not in wear
Imm. = Immature: LM1 in wear, LM2 not in wear
Subad. = Subadult: LM2 in wear, LM3 not in wear
A - LM3 forming, to just erupting through bone
B - LM3 erupting from bone to occlusal surface
Adult = LM3 in wear
A - LM3 up to minor dentine exposure on mesial surface
B - LM3 dentine exposure across central column
C - LM3 dentine exposure on distal column
Elderly = LM3 heavily worn, post stage-j (Grant 1982)

Note that the following data are based on the quantification of mandible fragments with at least one recordable molar or premolar.

Table 10.14 Pig dental data

AGE PERIOD	Neonat.	Juven.	Imm. A	Imm. B	Subad. A	Subad. B	Adult A	Adult B	Adult C	Elderly
100-175 EARLY ROMAN	-	-	1	-	-	-	1	1	-	-
175-250 MID ROMAN	-	1	1	3	1	1	1	-	-	-
250-450 LATE ROMAN	4	15	22	11	29	7	27	23	2	1
450-600 EARLY BYZANTINE	2	9	11	2	12	6	5	19	1	1
800-1000 SLAV	-	-	-	-	1	-	-	-	-	-
1750-1850 POST-MEDIEVAL	-	7	1	-	-	2	-	2	-	-

Definition of age periods (A.P.):

Neonat. = Neonatal
Juven. = Juvenile: LM1 not in wear
Imm. = Immature: LM1 in wear, LM2 not in wear
A - LM2 present in crypt
B - LM2 erupting up to occlusal plane
Subad. = Subadult: LM2 in wear, LM3 not in wear
A - LM3 present in crypt
B - LM3 erupting from bone to occlusal surfaceAdult = LM3 in wear
A - LM3 with enamel attrition only
B - LM3 minor dentine exposure
C - LM3 dentine exposure merging on mesial cusps
Elderly = LM3 heavily worn, post stage-j (Grant 1982)

Note that the following data are based on the quantification of mandible fragments with at least one recordable molar or premolar.

that, in this later period, the adult animals were mostly killed at the adult B stage and fewer were killed at adult A stage (7.4% as compared to 19.1% of the mandibles of late Roman date). If we follow published data for late maturing pigs (Habermehl 1975, Bull and Payne 1982), then the animals killed at the youngest age groups (with the first and second permanent molars not in wear) represent animals killed at an age of between twelve to fifteen months. Those killed at 'sub-adult A' stage include pigs killed at the age of two years, between fifteen to eighteen months, whereas the adult group comprises individuals which were about two and a half years old. It is worth remarking upon the apparent shift towards the killing of older pigs during the early Byzantine period, 31% of all mandibles being of 'adult B' to 'elderly' stage in this period, compared to only 18% in the late Roman period. This may be because a strategy of optimizing meat production had been adopted in the 5th and 6th centuries, when

Table 10.15 Sheep dental data

PERIOD	Neonat.	Juven.	Imm.	Subad. A	Subad. B	Adult A	Adult B	Adult C	Elderly
100-175 EARLY ROMAN	-	3	-	1	-	-	3	-	-
175-250 MID ROMAN	-	2	1	-	-	-	-	1	-
250-450 LATE ROMAN	-	7	10	15	3	6	11	41	2
450-600 EARLY BYZANTINE	-	3	6	6	3	3	6	25	-
1750-1850 POST-MEDIEVAL	-	1	1	2	-	1	-	2	-

Definition of age periods (A.P.):

Neonat. = Neonatal
Juven. = Juvenile: LM1 not in wear
Imm. = Immature: LM1 in wear, LM2 not in wear
Subad. = Subadult: LM2 in wear, LM3 not in wear
A - LM3 forming, to just erupting through bone
B - LM3 erupting from bone to occlusal surface

Adult = LM3 in wear
A - LM3 up to minor dentine exposure on mesial surface
B - LM3 dentine exposure across central column
C - LM3 dentine exposure on distal column
Elderly = LM3 heavily worn, post stage-j (Grant 1982)

Note that the following data are based on the quantification of mandible fragments with at least one recordable molar or premolar.

an increased number of animals were being killed at two and a half years or older. Overall, the evidence suggests intensive pig production and the fact that animals appear to have been slaughtered at regular age intervals suggests that the selection of animals for slaughter was to some extent a regulated operation.

Sheep dental data is sparse for the early and mid-Roman, Slav and post-medieval periods (Table 10.15). All that can be said is that sheep were slaughtered at ages ranging from juvenile to mature adult age. During the late Roman period there was a bimodal distribution in the slaughter pattern; most animals were killed during the ‘immature’ stage (when the second permanent molar was not yet in wear) to ‘sub-adult A’ stage (when the third permanent molar is just forming or erupting through the bone), or during the ‘adult C’ stage (when the third permanent molar had dentine exposure on its distal column). Most sheep (63%) were killed at ‘adult A’ stage or older, with the third permanent molar being worn. In the subsequent early Byzantine period this bimodal distribution appears to continue, suggesting that, for the most part, the same husbandry practices continued. The majority of animals (65%) were still killed at ‘adult A’ stage or older. The first of these peaks probably represents sheep killed off at the end of their first or beginning of their second year, whereas the later peak includes fully adult sheep of around four to seven years of age. The younger sheep killed were presumably stock surplus to breeding requirements and were killed for their meat. The older animals may have been kept for their milk and wool and then only slaughtered when they were considered to be no longer productive.

Epiphyseal fusion data

In the case of cattle, there exists insufficient information about the Roman, mid-Roman, Slav and post-medieval periods from which to draw any firm conclusions. All that can be said is that the figures broadly agree with the dental evidence in indicating that few calves were eaten by the inhabitants of the city (Table 10.16). No neonatal post-cranial material was recovered from the site. The absence of calves is also suggested by the early fusing group of bones (distal scapula, distal humerus and proximal radius). These should all be fused or fusing for most individuals by one year of age. During the late Roman period almost 99% of the epiphyses of these bones were fused and 94% in the early Byzantine period.

The pig epiphyseal fusion data broadly matches the dental statistics, in that it indicates that most animals were killed at an immature age (Table 10.17). A number of neonatal specimens were recovered during the excavation. These were noted in the following periods, areas and contexts: early Roman (A 2260, A 2277, D 699), mid Roman (M 4867), late Roman (C 4104, C 4211, D 659, E 1189, E 1191,

Table 10.16 Cattle epiphyseal fusion

PERIOD 1 (100-175) EARLY ROMAN	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	-	-	21	100.0
Intermediate	5	1	9	96.8
Late	6	1	5	94.6
PERIOD 2 (175-250) MID ROMAN	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	1	-	20	100.0
Intermediate	1	-	8	100.0
Late	1	-	5	100.0
PERIOD 3 (250-450) LATE ROMAN	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	31	4	331	98.8
Intermediate	32	12	94	96.4
Late	49	14	42	94.0
PERIOD 4 (450-600) EARLY BYZANTINE	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	15	6	99	94.3
Intermediate	24	6	54	92.7
Late	25	7	29	90.5
PERIOD 5 (800-1000) SLAV	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	-	-	2	100.0
Intermediate	-	-	1	100.0
Late	-	-	-	-
PERIOD 6 (1750-1850) POST-MEDIEVAL	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	1	-	19	100.0
Intermediate	3	1	11	96.8
	3	-	4	97.1

Key to cattle fusion periods:

EARLY: distal scapula, distal humerus, proximal radius, proximal phalanges I and II.
INTERMEDIATE: distal tibia, distal metapodials, proximal calcaneum.
LATE: proximal humerus, distal radius, proximal ulna, proximal and distal femur, proximal tibia.

Table 10.17 Pig epiphyseal fusion

PERIOD 1 (100-175) EARLY ROMAN	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	-	-	21	100.0
Intermediate	5	1	9	96.8
Late	6	1	5	94.6
PERIOD 2 (175-250) MID ROMAN	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	1	-	20	100.0
Intermediate	1	-	8	100.0
Late	1	-	5	100.0
PERIOD 3 (250-450) LATE ROMAN	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	31	4	331	98.8
Intermediate	32	12	94	96.4
Late	49	14	42	94.0
PERIOD 4 (450-600) EARLY BYZANTINE	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	15	6	99	94.3
Intermediate	24	6	54	92.7
Late	25	7	29	90.5
PERIOD 5 (800-1000) SLAV	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	-	-	2	100.0
Intermediate	-	-	1	100.0
Late	-	-	-	-
PERIOD 6 (1750-1850) POST-MEDIEVAL	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	1	-	19	100.0
Intermediate	3	1	11	96.8
	3	-	4	97.1

Key to pig fusion periods:

EARLY: distal scapula, distal humerus, proximal radius, pelvis.
INTERMEDIATE I: distal metacarpal, distal tibia.
INTERMEDIATE II: distal metatarsal, proximal calcaneum.
LATE: proximal humerus, distal radius, proximal ulna, proximal and distal femur, proximal tibia.

F 3288, K 4506, P 5049, P 5051, R 5218, S 5282), and early Byzantine (A 2118, D 542, D 607, E 1031, E 1036, E 1037, E 1087, F 3240). The presence of these neonatal individuals is itself a reliable indicator that pigs were being bred on the site. These specimens may represent stillbirths and other cases of infant mortality, as well as perhaps deliberate culling. In the early fusion group (distal scapula, distal humerus, proximal radius and pelvis), 75% of the counted epiphyses were fused during the late Roman period and 71% in the early Byzantine, indicating that respectively around 25% and 29% of pigs were killed at less than one year of age. This early fusion group more or less corresponds with the dental periods described as ‘neonatal’ to ‘immature’; these have broadly similar proportions of mandibles in this age category. Examining the changing patterns of pig epiphyseal fusion data through time, a higher percentage of young pigs were killed at less than one year of age in the early Roman period but this pattern was not followed in subsequent periods. This would appear to contradict the dental data. During the mid Roman and early Byzantine periods, the slaughter pattern appears to have been broadly similar. Only during the late Roman period there appear to have been slightly higher proportions of animals killed at an older age, represented by the intermediate and late fusion groups. However, these differences are relatively minor and may can not be regarded as particularly significant.

In the case of sheep, the epiphyseal fusion data broadly matches the dental data. Mostly animals were adult when slaughtered (Table 10.18). Three archaeological deposits, however, contained the remains of neonatal specimens. An early Roman deposit (A 2260) produced a collection of sheep trunk elements, whilst another (A 2277) included the partial remains of a lamb skeleton. In addition, a late Roman deposit (B 303) produced a neonatal occipital condyle fragment. The presence of this material suggests that sheep breeding may have taken place at Nicopolis. The epiphyseal fusion data suggests that there was no significant change in the age at which sheep were slaughtered from the mid Roman to early Byzantine periods. The apparently higher proportion of juvenile sheep killed in the early

Table 10.18 Sheep epiphyseal fusion

	Unknown	Unfused	Fused	% Fused
PERIOD 1 (100-175) EARLY ROMAN	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	14	6	9	60.0
Intermediate I	-	4	3	54.5
Intermediate II	12	6	3	48.4
Late	24	4	-	42.9
PERIOD 2 (175-250) MID ROMAN	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	16	-	17	100.0
Intermediate I	1	3	10	90.0
Intermediate II	16	6	2	76.3
Late	18	3	3	72.7
PERIOD 3 (250-450) LATE ROMAN	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	137	11	161	93.6
Intermediate I	37	18	69	88.8
Intermediate II	113	32	99	84.4
Late	136	23	24	80.8
PERIOD 4 (450-600) EARLY BYZANTINE	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	65	6	75	92.6
Intermediate I	20	12	48	87.2
Intermediate II	63	22	50	81.2
Late	68	17	14	76.6
PERIOD 5 (800-1000) SLAV	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	-	-	1	100.0
Intermediate I	-	-	-	-
Intermediate II	1	-	-	-
Late	-	-	-	-
PERIOD 6 (1750-1850) POST-MEDIEVAL	**Unknown**	**Unfused**	**Fused**	**% Fused**
Early	6	1	8	88.9
Intermediate I	-	1	5	86.7
Intermediate II	8	-	4	89.5
Late	3	2	1	81.8

Key to sheep fusion periods:

EARLY: distal scapula, distal humerus, proximal radius, pelvis.
INTERMEDIATE I: distal metacarpal, proximal phalanges I and II.
INTERMEDIATE II: proximal ulna, proximal femur, distal tibia, distal metatarsal, proximal calcaneum.
LATE: proximal humerus, distal radius, distal femur, proximal tibia.

Roman period is based upon a relatively small sample and is probably unduly weighted in favour of young animals by the discovery of the lamb skeletons described above.

Sex Data

The sex data available for cattle is limited but it seems possible that, in the late Roman period, more females were kept than males (Table 10.19). This gives some support to the suggestion, made above, that many of the older animals may have been used as dairy cattle. Information for other periods is either lacking or insufficient for any meaningful comparison.

Twice as many male pigs were found as females for the late Roman and early Byzantine periods. Young males, surplus to breeding requirements, are likely to have been selected for slaughter at an earlier age. However, this apparent imbalance in numbers might not have been so great as the numbers suggest. Taphonomic factors may have distorted the picture; male canines are more robust than their female counterparts and are consequently easier to identify.

Sex data for sheep is particularly scarce for most periods. Roughly equal amounts of males and females were recorded for the late Roman and early Byzantine periods. This

Table 10.19 Sex data

PERIOD	1	2	3	4	5	6
DATE	**100-175**	**175-250**	**250-450**	**450-600**	**800-1000**	**1750-1850**
PERIOD	**Early Roman**	**Mid Roman**	**Late Roman**	**Early Byzantine**	**Slav**	**Post-Medieval**
	N	**N**	**N**	**N**	**N**	**N**
CATTLE						
Female	1	-	6	1	-	-
?Female	1	-	4	1	-	-
Male	-	-	-	1	-	-
?Male	-	-	3	-	-	-
PIG						
Female	2	-	38	6	-	6
Male	1	1	73	12	1	4
SHEEP						
Female	2	3	9	5	-	-
?Female	-	1	1	-	-	-
Male	-	1	9	5	1	1
?Male	-	1	5	-	-	-

Based on examination of acetabulum-ischium margin in pelves for cattle and sheep, and presence of canine tooth for pig.

seems to suggest that there was no concentration or dependence on sheep because, if there was, a less balanced ratio would be expected; ie, more adult females, if the intention had been to optimize milk or meat production.

Butchery

Comparatively little research in the region has been done on butchery practices during the Roman period, despite the fact that important cultural information may be derived from such a study. The frequent presence of butchery marks was noted during the recording of the mammal bone assemblage. These usually took the form of chop marks, probably made with some sort of axe or cleaver, or cut marks made with a sharp knife. Most of these butchery traces were made during the basic dismemberment of the animal carcasses, producing manageable portions for consumption. A few bones also showed traces of so-called ‘filleting cuts,’ ie, longitudinal cut marks, normally found on the diaphyses, which occur when strips of meat are removed from the bone. In a number of cases, there were traces of the characteristic cut marks made when skinning an animal. As no discernable differences in butchery practices could be assigned to a particular period, butchery procedures are described as a whole for each of the main species.

Nine horse bones had clear traces of butchery chop and saw marks. These were noted for the mid Roman (C 4126), late Roman (C 5306, C 5311 and D 659) and early Byzantine periods (A 2011, A 2108, A 2218, D 445 and E 1036). Chops were observed to a scapula glenoid, a distal humerus, a pelvis (acetabulum), the proximal part of a calcaneus, and to both proximal and distal parts of the metatarsal. The presence of these butchered horse bones indicates that horse carcasses were sometimes dismembered and perhaps horse meat was also eaten from time to time. Alternatively, some of the butchered horse metapodials may have been deliberately collected for the manufacture of bone artefacts and tools.

Cattle would seem to have been decapitated by chopping through the atlas or axis. Chop and cut marks to the occipital condyles were also observed, suggesting that this was a common dismembering point. Horns were chopped off either at their base or together with the intercornual ridge. Skulls were split into two halves, presumably to facilitate removal of the brain. This seems to have commonly taken place from the basio-occipital direction. Cuts were made to the ramus of mandibles as well as to the lingual surface of the tooth row, often below the PM3–PM4 position, which suggests that the tongue was often removed.

Butchery of the trunk elements was regularly noted. Vertebrae were heavily damaged by axial chops to their lateral aspects as well as by oblique medio-lateral chops, but do not appear to be generally split. Ribs were chopped and cut just below their proximal articulation to separate them from the vertebral column, and were also sectioned lower down to reduce them into suitable portions.

The dismembering of the forelimbs from the body was probably carried out by severing the muscle and gristle attachments connected to the trunk. Butchery of the forelimb appears to have then proceeded with dismemberment of the scapula, incited by cuts/chop marks along the inferior border of the condyle and at the origin of the triceps brachii, as well as along the neck of the scapula. The humerus generally appears to have been chopped and smashed up, presumably to extract marrow, usually only the distal ends remaining partially intact but showing traces of chops and cuts which point to dismemberment from the elbow joint. The radius was usually chopped to its proximal (elbow joint) end, and does not appear to have been generally separated from the ulna. The olecranon shows chops and cuts indicative of dismemberment of the radio-ulna from the elbow joint. Metacarpals were dismembered by chops at both proximal and distal articulations, and seem to have been sometimes split, perhaps to produce blanks for bone working.

Dismemberment of the hind-limb began by chopping through the ilium of the pelvis. Further sectioning of the pelvis appears to have sometimes taken place by additional chops occasionally into the ischium and pubis. The femur was normally separated by chops through its neck or into its *Capita femoris*. Femurs were usually very fragmented which suggests that they were also chopped and smashed up to extract the marrow. The tibia was mostly chopped at its proximal (knee joint) articulation, with

occasional chops to its distal articulation. Both astragalus and calcaneus showed traces of chops and cuts which suggests basic dismemberment of the hock joint. The metatarsal, like the metacarpal, had traces of chops to both extremities and also seems to be split in some cases.

Phalanges, generally, were not heavily butchered, although some first and second phalanges were chopped, probably for further dismemberment of the hoof.

There was some evidence to suggest that the skinning of cattle may have occasionally been carried out on the site. Several specimens had characteristic cut marks such as those described by Binford (1981, 286, 290). These came from an early Roman deposit (B 265) as well as from several late Roman deposits (B 247, B 250, D 610 and R 5218). They were mostly first phalanges with traces of transverse cuts to their anterior midshafts. A metatarsal also had traces of circular cuts around its distal midshaft.

The butchery of pigs was carried out using similar techniques to those described for cattle. The only major differences in the case of pigs were as follows: the trunk was regularly split by axial chops through the vertebral column, dividing the carcasses into two halves. The major limb bones were not generally so fragmented and smashed as cattle, presumably because the smaller sized portions fitted more easily into the cooking pot.

Many young pig bones probably would not have required much butchery. In addition, one particularly interesting early Byzantine deposit (E 1034) contained the remains of an articulated hind-limb of an immature pig. This find comprized a distal tibia (fused) and fibula as well as an astragalus and calcaneus (unfused proximal). These connected bones are particularly interesting because they suggest the preparation of salted or smoked ham, which were often hung by the Achilles tendon, attached to the tuber calcanei (Bökönyi 1984, 107).

The butchery of sheep was also carried out using similar techniques to those used for cattle. The only major differences were that sometimes horns were left undamaged, presumably being too small or unsuitable for horn-working. An exceptional case was the group of large ram horncores from the drain in area E (1088), mentioned above. These showed traces of butchery chop marks which suggests that they were removed from the skull by chopping though the base of the horn.

Red deer was mostly represented by antler fragments, all of which showed traces of chop and saw marks. Antler would undoubtedly have been an important source of raw material for the manufacture of artefacts, tools, etc. (see above, the worked bone, p. 79). Although collecting shed antlers would seem to have been the most common means of obtaining this material, the chop and cut marks on antlers also suggest that carcasses may have been brought to the city and then the antlers were chopped or sawn off when they were still attached to the skull. That the animals were skinned is hardly surprising; a first phalanx from a late Roman deposit (C 152) had traces of a transverse cut mark to its anterior proximal midshaft, which suggests that the animal had been skinned.

Breed Types

The majority of cattle skulls were split or smashed during butchery, leaving few complete horncores which could have provided information about the various breeds kept at Nicopolis. However, during the early Roman period, there appear to have been at least two types of cattle, one represented by horncores which had a medium-large diameter with long outward pointing, slightly twisting horns with upward pointing tips. The second breed had horns of a medium sized diameter with short strongly curved horns. During the mid to late Roman periods, cattle belonging to the first breed were certainly present. In the early Byzantine period, the primary fill of the drain in area E (1088), contained a group of horncores which were all of medium-large diameter type, with long outward pointing, slightly twisting horns with upward pointing tips (although one example had backward pointing tips). No hornless cattle were identified.

Two types of horned sheep were present at Nicopolis. The most common type was the so called 'Copper sheep' type, in which horncores were long, massive, triangular in cross section at their base and flattened towards the tip, laterally oriented and twisting. These horncores were found in early Roman (D 699), mid Roman (D 676), late Roman (E 1112 and R 5218), and early Byzantine (A 2118, A 2159 and E 1008) deposits. Some studies have suggested that the 'copper sheep' type belong to

rams (Reitsma 1932). The other horned sheep present had a much smaller shorter and straighter horncore, and this breed was identified in a late Roman deposit (C 4110). This type of horncore may have belonged to ewes. Of particular interest was the presence of a hornless breed of sheep in the early Roman period (A 2259). The skull fragment had a slight depression in the place where the horn should have been, and appears to come from a ewe, judging by the general thickness of the skull.

Goats only appear to be present in relatively small numbers at Nicopolis. The surviving horncore fragments were of the so-called 'aegagrus' type, with a scimitar shaped, untwisted form. Examples of horns of this type were found in early Roman (A 2260), mid Roman (D 667), late Roman (C 4032, D 538, D 601, D 661 and F 3288) and early Byzantine (A 2118 and E 1008) deposits.

Palaeopathology

Studying the pathology of archaeological bone material is an important way in which we can identify what animal diseases were present in the past, as well as providing information as to which husbandry techniques were practiced. Earlier analysis of faunal assemblages in Bulgaria has generally neglected to include this important source of information. During the recording of the Nicopolis assemblage a particular effort was therefore made to describe all pathological abnormalities. The pathological specimens identified could broadly be grouped into the following types: traumatic injury, arthropathies and joint diseases, oral pathology, ?infection and skeletal abnormalities.

Traumatic Injury

A number of specimens bore the signs of having suffered fractures or traumatic blows. In the early Roman period, a cattle-sized rib shaft fragment (D 699) had a healed fracture, the healing process being marked by callus formation and a slight deformation and realignment of the rib axis. Several specimens were identified with signs of trauma from the late Roman period. A pig distal tibia shaft fragment (B 250) had a small bone spur, *c* 3mm in length, projecting from its lateral margin, perhaps resulting from a minor trauma. A pig fourth metatarsal (K 4507) had a small bone lump, *c* 4mm in diameter, projecting from its posterior midshaft, perhaps the result of a minor trauma. A pig fibula (K 4516) had a healed fracture with callus formation and a realignment of the fibula axis. A sheep/goat ulna (D 553) was clearly bowed at its midshaft, below its articulation, perhaps the result of an earlier healed fracture. Finally, a red deer second phalanx (B 280) had traces of minor exostoses protruding from its lateral midshaft. There were no other associated characteristics suggesting that this was of osteoarthritic origin (ie, eburnation, lipping of the articular surface, etc.), so it is likely that this was the result of a minor trauma. Two cattle bones from post-medieval deposits exhibited traces of trauma. A cattle proximal ulna (C 88) had extensive traces of bone remodelling. The proximal olecranon appeared to have been severely fractured, leading to the two fracture planes slipping down beside each other on the medial aspect, while a new callus formation had formed on the lateral aspect. This had probably resulted from a major trauma to the proximal olecranon (elbow joint). A cattle-sized rib shaft (D 414) had a slightly deformed margin with minor callus formation which points to the animal having suffered a minor trauma.

The majority of the traumatic injuries described above could have occurred during the day to day handling of animals. However, it is worth noting that all the injuries to pig occurred to the distal end of their legs. Boessneck *et al* (1971) have suggested that tethering pigs by their hind legs may cause such injuries.

Arthropathies and Joint Diseases

The most common type of pathology observed in the assemblage were arthropathies, diseases of the joints.

Eight examples found in late Roman deposits showed clear signs of diseased joints: a horse first phalanx (B 211) had traces of bone expansion with exostoses just below the proximal articular surface on its medial and lateral faces. Another horse's first phalanx (F 3314) had traces of exostoses to its proximal articular margins, both upper lateral midshaft margins and to its proximal anterior midshaft.

A horse's second phalanx (F 3297) had traces of minor bone expansion with exostoses present to both lateral midshafts. A cattle acetabulum (B 243) had traces of eburnation to the pubic facet of its inner acetabulum. A cattle first phalanx (F 3361) had minor traces of exostoses to its proximal medial midshaft. Two cattle third phalanges (C 4209 and D 682) both had new bone formation, resulting in an extension to their upper proximal articular margins. Finally, a sheep/goat metatarsal (B 249) had its proximal articulation surface extended by new bone formation to its proximal lateral margin.

Five examples of bones showing traces of arthropathy came from early Byzantine deposits. Two cattle-sized thoracic vertebrae (E 1088) had traces of minor bone formation to the margins of their centrae, and a cattle first phalanx in the same deposit had traces of minor exostoses to its proximal medial margin, proximal anterior midshaft, as well as to the medial and lateral facets of its distal articulation. A sheep/goat first phalanx (D 636) had traces of exostoses to its medial midshaft, as well as to both medial and lateral faces of its distal articulation. Finally, a red deer scapula (E 1072) had signs of new bone formation around the margins of the glenoid articulation.

A single example was found in a post-medieval context (D 451). This was a cattle first phalanx which had traces of exostoses to the lateral face of its distal articulation, as well as to its distal anterior midshaft.

The symptoms of the pathological horse bones described above appear to belong to the so-called phenomenon of 'ringbone.' The two first phalanges (B 211, F 3314) appeared to have traces of 'high ring bone', ie, affecting the first interphalangeal joint, whilst the second phalanx (F 3297) seemed to be a minor case of 'false ring bone', ie, affecting only the lateral midshaft areas. Baker and Brothwell (1980, 120) report that ringbone was common during the last century but that it is relatively rare in modern horses, being mainly a disease of the front feet of heavy draught horses. They also note that ring bone nearly always causes a greater or lesser degree of lameness at least until ankylosis has occurred. The appearance of this disease at Nicopolis therefore suggests that horses were used as draught animals.

The symptoms of the pathological cattle, sheep/goat and red deer bones described above, all appear likely to have been caused by 'osteoarthritis'. However, as Brothwell and Baker (1980, 114) point out, it is dangerous to diagnose this condition simply because exostoses are present. They suggest that at least three out of the four symptoms should be found before definitely diagnosing osteoarthritis. These are; (1) grooving of the articular surface of the bone, (2) eburnation, (3) extension of the articular surface by new bone formation, and (4) exostoses around the periphery of the bone. None of the finds noted above exhibit all these symptoms although changes 2, 3 and 4 are present in different specimens. Even so, osteoarthritis may still be the cause of these pathological changes which may simply represent early stages in the development of the disease but the evidence is not decisive. In favour of such a diagnosis is, however, the fact that it is well known that archaeological assemblages often demonstrate the presence of osteoarthritis affecting the feet of cattle, and it is perhaps therefore significant that five of the specimens listed above were cattle phalanges.

The precise cause of osteoarthritis is still not fully understood but it often appears to result from constant trauma to the joint, speeding up the ageing process, although other factors may have been involved (Baker and Brothwell 1980, 115). It has been suggested by Armour-Chelu and Clutton-Brock (1985) that cattle used for draught purposes may show these bone changes, although they could also be caused by the constant thump of the animal's limbs on hard cobbled streets or metalled roads (Baker and Brothwell, 1980, 115). At least, this is most unlikely to have been the explanation in the case of the sheep/goat and red deer. No doubt these animals were either old individuals, or animals which had suffered some sort of trauma.

Oral Pathology

Surprisingly few examples of oral pathology were observed amongst the Nicopolis material. There was no evidence of chronic periodontal disease amongst the domestic ruminants, which suggests that, for the most part, the livestock was relatively healthy and well treated. Only four dental specimens showed any evidence of pathological traces. A deposit of early Roman date produced a sheep/goat

upper molar (A 2260) which had traces of swollen roots with small bone-like extensions forming on the root tips. In the late Roman period a cattle lower permanent incisor (P 5051) had a thin polished band encircling it at the enamel-root junction. It is not entirely clear if this is a pseudo-pathology (ie, man-made) or a genuine pathology. An extremely worn sheep/goat lower second molar (B 249) had traces of swollen roots, similar to the first of these specimens. Finally, a sheep/goat lower third molar (F 3364) had a curious small bone nodule (*c* 2mm in diameter) present to the bucchal surface of its central column.

Infection

Just a single example was found of what may have been an animal which had suffered some form of infection. A sheep/goat metatarsal from a mid-Roman deposit (D 676) had a bone swelling present to its lateral midshaft. This may represent an ossified haematoma resulting from a traumatic injury, but could also result from osteomyelitis, since it had the characteristic new periosteal and endosteal bone. The precise diagnosis remains uncertain.

Skeletal Abnormalities

Two sheep horncores had characteristic depressions to their medial/lateral aspects like the so-called ‘thumbprints’ described by Hatting (1974). A sheep horncore in an early Byzantine deposit (B 210) had a single oval shaped depression. Another example came from a post-medieval context (K 4430) and this had a pair of oval shaped depressions. It has been suggested by Hatting and others that this condition indicates malnutrition. But these were the only specimens from the whole assemblage which provided such evidence so, although this may be true of these particular individuals, there is no reason to assume that malnutrition was a general problem in either the early Byzantine or post-medieval periods.

Cattle Biometry

All the measurements taken on cattle bones are presented in Appendix 10.1. Withers heights (WH) were calculated for the few complete cattle limb bones recovered using the criteria desribed by

Table 10.20 Estimated withers heights of cattle

Period 1 (100-175)				
EARLY ROMAN				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
B/267	metacarpal	GL = 197.0	X 6.12	120.6
B/267	metacarpal	GL = 198.0	X 6.12	121.2
B/267	metatarsal	GL = 236.0	X 5.45	128.6
MEAN				**123.5**
Period 3 (250-450)				
LATE ROMAN				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
A/2017	radius	GL = 287.8	X 4.30	123.8
D/537	Metacarpal	GL = 197.0	X 6.12	120.6
R 5218	Metacarpal	GL = 240.8	X 6.12	147.4
C/5302	Metatarsal	GL = 250.6	X 5.45	136.6
F/3366	Metatarsal	GL = 228.0	X 5.45	124.3
F/3366	Metatarsal	GL = 231.0	X 5.45	125.9
MEAN				**129.8**
Period 4 (450-600)				
EARLY BYZANTINE				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
K 4502	Radius	GL = 312.4	X 4.30	134.4
A/2251	Tibia	GL = 315.0	X 3.45	108.7
D/548	Metacarpal	GL = 208.0	X 6.12	127.3
K 4498	Metatarsal	GL = 223.1	X 5.45	121.6
MEAN				**123.0**

Calculated according to Matolsci (1970) and Fock (1966), cited in Von den Driesch and Boessneck (1974).
WH = withers height.

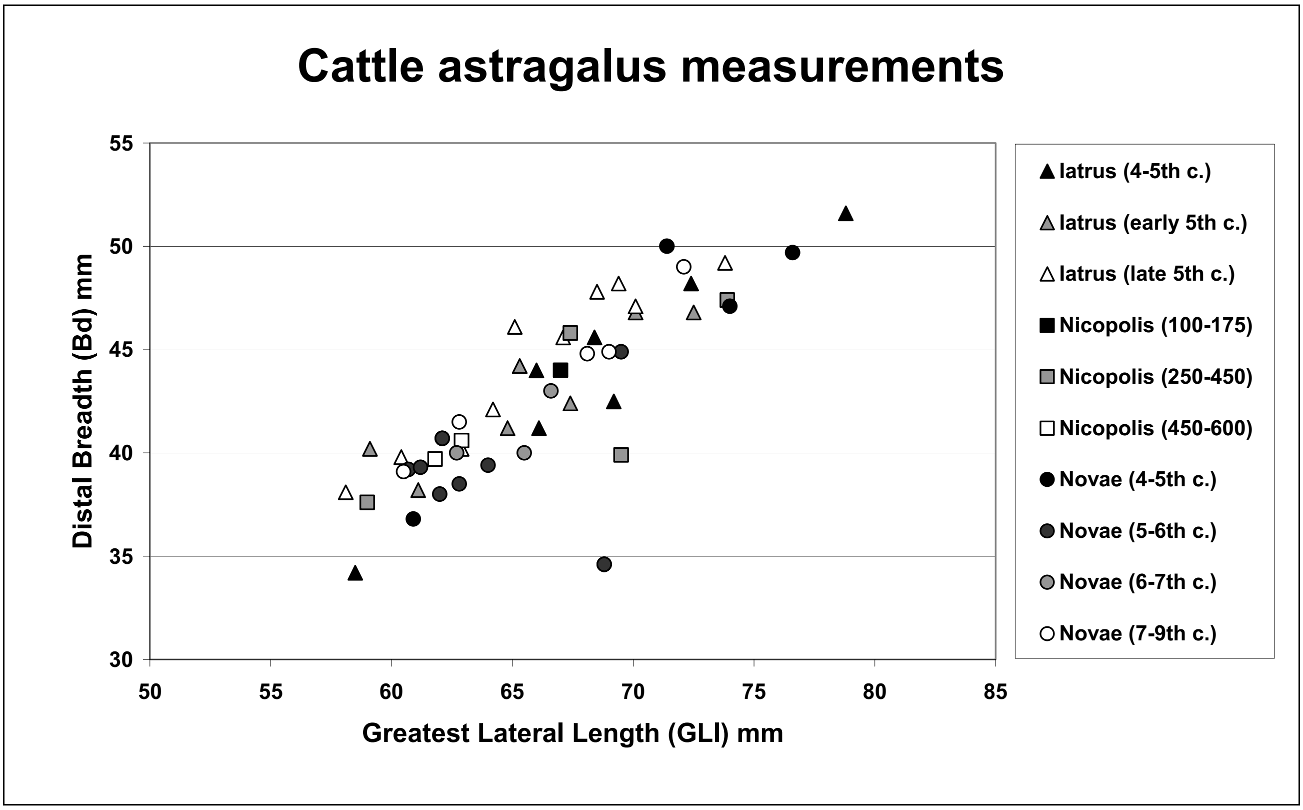


Fig 10.2 Size of cattle astragali at Roman, late Roman and early Byzantine sites in Bulgaria

Matolsci (1970) and Fock (1966) (cited in von den Driesch and Boessneck 1974). Table 10.20 presents the results of this analysis. In the early Roman period the mean withers height was 123.5cm. By the late Roman period this had increased to 129.8cm. Smaller cattle, which had a mean withers height of 123cm, were again present in the early Byzantine period. Such withers heights fall within the known range for the periods in question. It is tempting to view the apparent increase in the mean size of cattle between the early and late Roman periods as indicating the efficacy of improved Roman breeding methods, or perhaps the introduction of new larger breeds. The sample size is, however, quite limited and so such minor differences may simply be because the sample is small and possibly unrepresentative. Still, it does seem that there were some quite small cattle in the early Byzantine period. One particular deposit of that date (A 2251) contained a very small individual, represented by a tibia with a total length of 315mm, which, according to Matolsci (1970), gives a withers height of only 108.7cm.

Figure 10.2 compares the size of cattle astragali from Nicopolis with published data from the broadly contemporary sites of Iatrus and Novae. There is considerable overlap in the size distributions of the three sites and there is no obvious pattern of change in size through time. Consequently, it seems that similar sized cattle were present at all three sites.

Pig Biometry

There were no complete skulls and few post-cranial elements sufficiently well-preserved to permit detailed biometric evaluation of the pigs. This was partly due to the fact that these animals were mainly exploited for their meat and were killed when still immature. Many of the pig bones were also butchered, leaving relatively few intact specimens. The only bones complete enough to permit the reconstruction of withers heights, using the indices provided by Teichert (1969, 286), were the astragalus and calcaneus. The results are presented in Table 10.21.

The average withers heights for pigs from West and Central European sites of the high Roman period is about 70 cm (Bökönyi 1984, 54). Material from the early and late Roman periods therefore

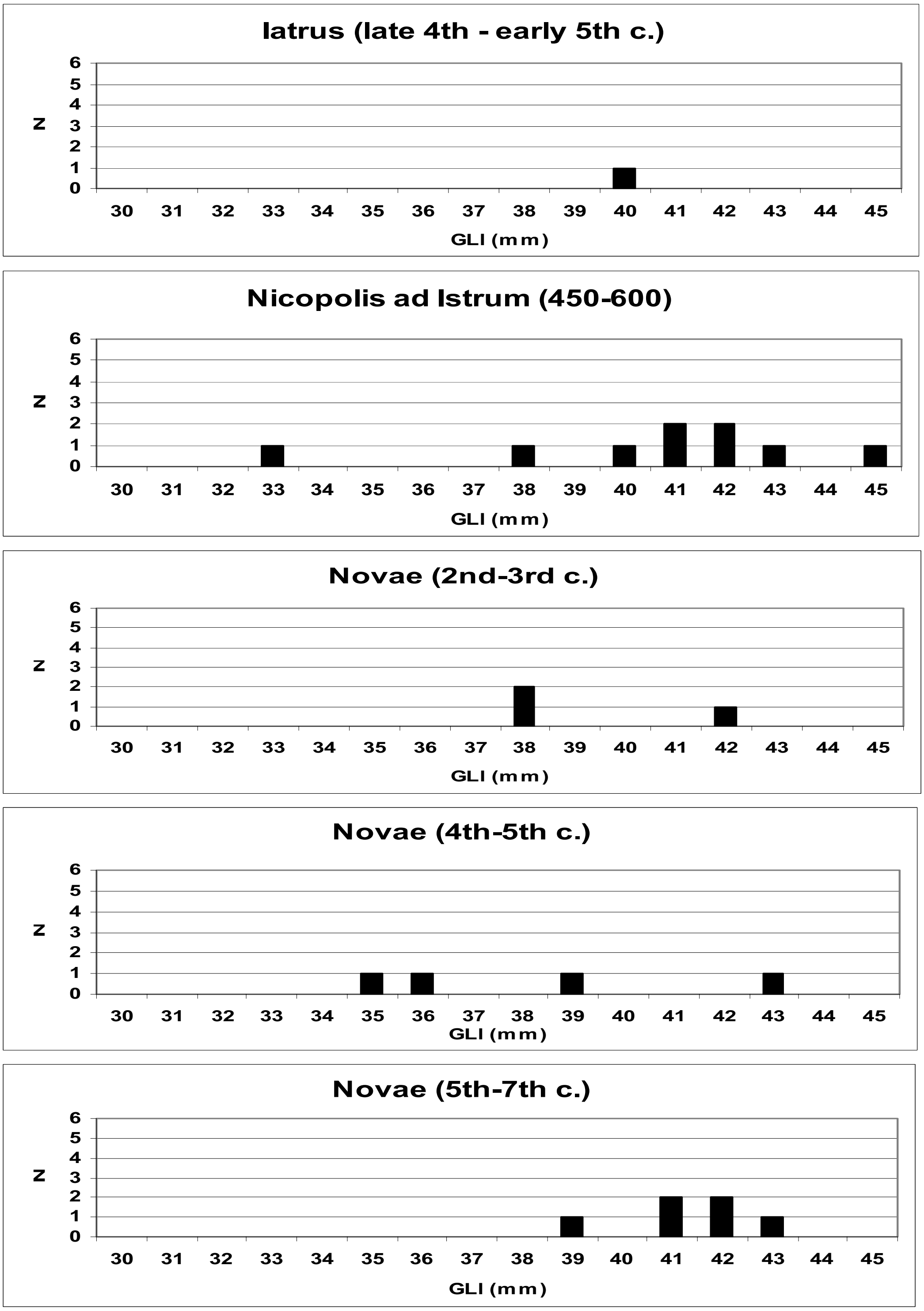


Fig 10.3 Greatest lateral length of pig astragalus at Roman, late Roman and early Byzantine sites in Bulgaria

Table 10.21 Estimated withers heights of pig

Period 1 (100-175)				
EARLY ROMAN				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
A/2277	calcaneus	GL = 75.0	X 9.34	70.1
Period 3 (250-450)				
LATE ROMAN				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
B/241	Astragalus	GL = 41.3	X 17.90	73.9
B/243	Astragalus	GL = 42.5	X 17.90	76.1
B/244	Astragalus	GL = 37.0	X 17.90	66.2
B/247	Astragalus	GL = 37.8	X 17.90	67.7
B/247	Astragalus	GL = 40.5	X 17.90	72.5
B/248	Astragalus	GL = 38.5	X 17.90	68.9
B/249	Astragalus	GL = 42.0	X 17.90	75.2
B/280	Astragalus	GL = 37.0	X 17.90	66.2
B/300	Astragalus	GL = 42.0	X 17.90	75.2
C/130	Astragalus	GL = 40.6	X 17.90	72.7
C/151	Astragalus	GL = 37.4	X 17.90	66.9
C/4033	Astragalus	GL = 40.5	X 17.90	72.5
D/604	Astragalus	GL = 32.5	X 17.90	58.2
D/635	Astragalus	GL = 39.2	X 17.90	70.2
E/1134	Astragalus	GL = 40.2	X 17.90	72.0
E/1191	Astragalus	GL = 39.5	X 17.90	70.7
P/5018	Astragalus	GL = 36.6	X 17.90	65.5
P/5018	Astragalus	GL = 37.0	X 17.90	66.2
P/5050	Astragalus	GL = 37.2	X 17.90	66.6
P/5051	Astragalus	GL = 39.9	X 17.90	71.4
R 5218	Astragalus	GL = 40.0	X 17.90	71.6
A/2236	Calcaneus	GL = 62.8	X 9.34	58.7
D/665	Calcaneus	GL = 61.3	X 9.34	57.3
F/3291	Calcaneus	GL = 58.4	X 9.34	54.5
F/3301	Calcaneus	GL = 76.1	X 9.34	71.1
P/5018	Calcaneus	GL = 78.1	X 9.34	72.9
MEAN				**68.5**
Period 4 (450-600)				
EARLY BYZANTINE				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
A/2014	Astragalus	GL = 42.5	X 17.90	76.1
D/473	Astragalus	GL = 33.1	X 17.90	59.2
D/542	Astragalus	GL = 41.2	X 17.90	73.7
E/1024	Astragalus	GL = 43.0	X 17.90	77.0
E/1034	Astragalus	GL = 38.5	X 17.90	68.9
E/1036	Astragalus	GL = 41.2	X 17.90	73.7
E/1078	Astragalus	GL = 40.0	X 17.90	71.6
E/1078	Astragalus	GL = 42.2	X 17.90	75.5
E/1101	Astragalus	GL = 45.4	X 17.90	81.3
A/2014	Calcaneus	GL = 84.9	X 9.34	79.3
E/1078	Calcaneus	GL = 82.2	X 9.34	76.8
E/1101	Calcaneus	GL = 82.2	X 9.34	76.8
MEAN				**74.2**

Calculated according to Teichert (1969).
WH = withers height.

falls within the known range, although the size of pigs in the early Byzantine period is slightly higher than the average. This may reflect a change in pig husbandry and the development of improved methods of keeping and breeding.

Figure 10.3 compares the lateral length of pig astragali from Nicopolis with published data from Iatrus and Novae. There is a considerable overlap in the size of the animals represented at the three sites, although there is a hint that slightly larger pigs were present in the early Byzantine period at Nicopolis. This fits well with the above suggestion, based on the age data, that there was an apparent shift towards the killing of older, and therefore larger pigs, in the early Byzantine period.

Sheep Biometry

Withers heights were calculated for sheep using the indices developed by Teichert (1975). The results of this analysis are presented in Table 10.22. The mean withers height of sheep in the mid Roman period

Table 10.22 Estimated withers heights of sheep

Period 2 (175-250)				
MID ROMAN				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
P/5025	Metatarsal	GL = 137.5	X 4.51	62.0
Period 3 (250-450)				
LATE ROMAN				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
A/2017	Calcaneus	GL = 57.8	X 10.23	59.1
A/2023	Calcaneus	GL = 56.8	X 10.23	58.1
C/121	Calcaneus	GL = 63.0	X 10.23	64.4
C/129	Calcaneus	GL = 60.3	X 10.23	61.7
D/661	Calcaneus	GL = 61.0	X 10.23	62.4
D/689	Calcaneus	GL = 58.8	X 10.23	60.2
D/704	Calcaneus	GL = 65.5	X 10.23	67.0
P/5018	Calcaneus	GL = 68.5	X 10.23	70.1
D/689	Metacarpal	GL = 118.0	X 4.84	57.1
M 4869	Metacarpal	GL = 120.3	X 4.84	58.2
C/4110	Metatarsal	GL = 140.0	X 4.51	63.1
C/5306	Metatarsal	GL = 122.7	X 4.51	55.3
D/701	Metatarsal	GL = 125.5	X 4.51	56.6
F/3288	Metatarsal	GL = 131.8	X 4.51	59.4
MEAN				**60.9**
Period 4 (450-600)				
EARLY BYZANTINE				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
D/542	Metacarpal	GL = 117.3	X 4.84	56.8
D/636	Calcaneus	GL = 62.6	X 10.23	64.0
E/1036	Calcaneus	GL = 60.2	X 10.23	61.6
E/1036	Calcaneus	GL = 61.2	X 10.23	62.6
E/1036	Calcaneus	GL = 61.4	X 10.23	62.8
K 4504	Calcaneus	GL = 58.5	X 10.23	59.8
MEAN				**61.3**

Calculated according to Teichert (1975).
WH = withers height.

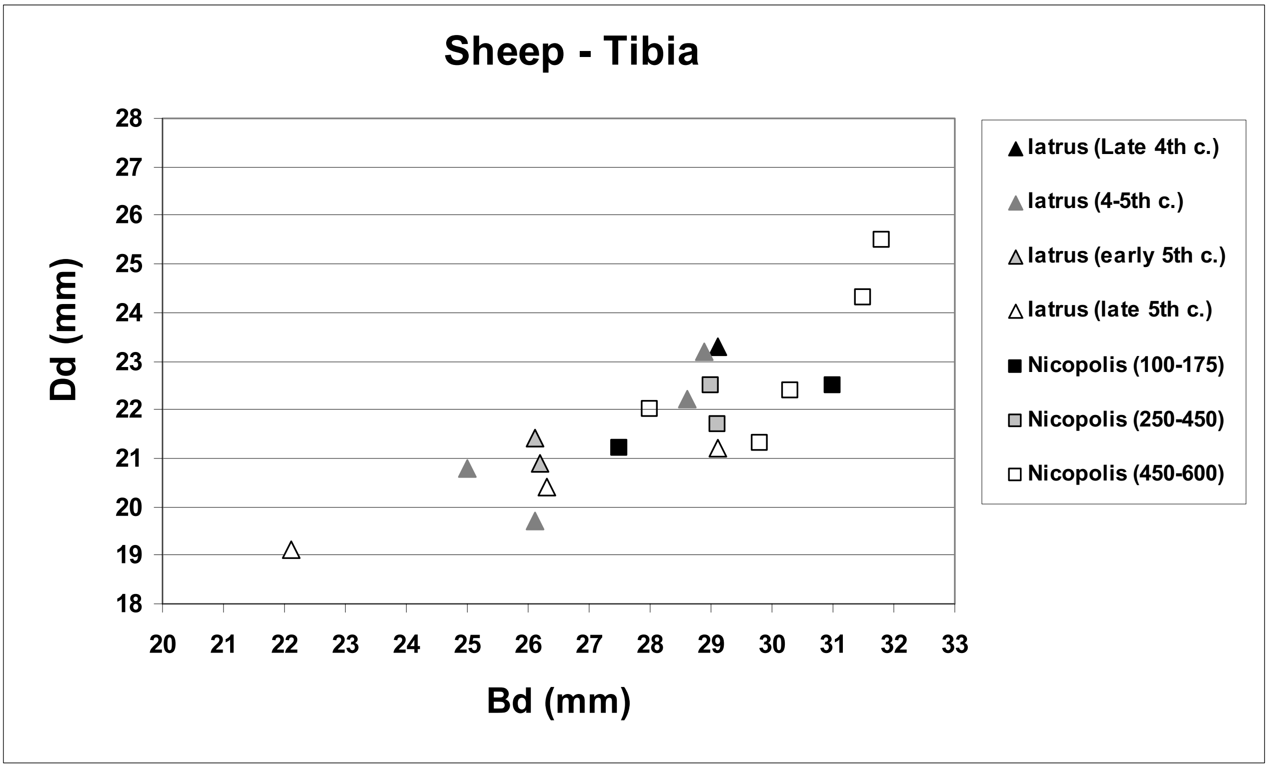


Fig 10.4 Size of sheep tibia at Roman, late Roman and early Byzantine sites in Bulgaria

was 62cm, in the late Roman period it was 60.9cm, and in the early Byzantine period it was 61.3cm. It therefore seems that sheep were of about the same size throughout the Roman to early Byzantine period. Figure 10.4 compares the relative size of the distal epiphysis of sheep tibia from Nicopolis with published data from Iatrus. There is a high degree of correlation in the size of animals from the two sites, although a few of the Nicopolis specimens were somewhat larger than those at Iatrus.

OTHER DOMESTIC FAUNA

Horse (*Equus caballus* L.)

Horse bones were present in small numbers in all periods, except for the Slav period but then the size of that assemblage is too small for the absence of horse remains to be considered significant. All individuals represented were adult animals, the only exception being a mandible of a juvenile horse from a single early Roman deposit (A 2269). This mandible had its third permanent molar still visible in its crypt but it had not yet erupted.

Withers heights for horses were calculated using the indices of Kieswalter (von den Driesch and Boessneck 1974) and are presented in Table 10.23. Two horse tibias came from the same early Roman deposit (A 2281) one with a lateral length of 332mm, the other of 340mm, which averages out as a withers height of 146.5cm. The relatively large size of these horses perhaps suggests that they belonged to the Roman military horse type. Much smaller horses were represented by finds of late Roman date. One metacarpal (A 2235) indicates a withers height of 137cm and two other metatarsals point to a withers height of 137 and 140.7cm. The smaller size of these animals perhaps indicates that they were from an ordinary local breed. Slightly larger horses again appear in the early Byzantine period when the withers heights of recorded specimens varied between 134 and 147.8cm.

Ass (*Equus asinus* L.)

Six ass bones were identified. An early Roman deposit (A 2269) contained a mandible fragment which had the characteristic short diastema and teeth of Equus asinus. Four specimens dated to the late Roman period; a distal metatarsal and first and second phalanges fragments (B 311), all of which were very burnt and probably belonged to the same individual. A second phalanx (P 5018), with a total

Table 10.23 Estimated withers heights of horse

Period 1 (100-175)				
EARLY ROMAN				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
A/2281	Tibia	Ll = 360.0	X 4.36	144.8
A/2281	Tibia	Ll = 370.0	X 4.36	148.2
MEAN				**146.5**
Period 3 (250-450)				
LATE ROMAN				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
A/2235	Metacarpal	GL = 198.0	X 6.41	126.9
B/244	Metatarsal	GL = 257.0	X 5.33	137.0
C/5306	Metatarsal	GL = 264.0	X 5.33	140.7
MEAN				**134.9**
Period 4 (450-600)				
EARLY BYZANTINE				
Context	**Element**	**Measurement (mm)**	**Index**	**WH (cm)**
A/2118	Humerus	GL = 285.0	X 4.87	138.8
A/2118	Radius	GL = 325.0	X 4.34	141.4
A/2118	Tibia	GL = 339.0	X 4.36	147.8
A/2011	Metacarpal	GL = 227.0	X 6.41	145.5
A/2118	Metacarpal	GL = 209.0	X 6.41	134.0
A/2118	Metacarpal	GL = 212.0	X 6.41	135.9
E/1101	Metatarsal	GL = 267.0	X 5.33	142.3
MEAN				**140.8**

Calculated according to Kieswalter, cited in Von den Driesch and Boessneck (1974).
WH = withers height.

length of 37.9mm and a proximal articular breadth of 38.3mm came from a late Roman dump level and an early Byzantine level (D 412) produced a third phalanx fragment.

The fact that these were ass bones was determined by comparing them with reference material in the Department of Archaeology and Prehistory at the University of Sheffield. Asses would have been used as beasts of burden for the transportation of goods. They are common finds on sites of the Roman imperial period and it is generally acknowledged that the Romans played an important role in the spread of this animal across Europe (Bökönyi 1974, 301).

Camel (*Camelus* sp.)

Two camel bones were found (Fig 10.5). These were a distal metatarsal from a late Roman deposit in area D (584), and a proximal metatarsal from an early Byzantine level in area F (3240). Their identification was confirmed by Nikolai Spassov, who checking the bones with comparative specimens of *Camelus bactrianus* in the mammal collection of the National Natural History Museum, Sofia. The proximal metatarsal facet was quite distinctive and the distal metatarsal shaft fragment had the characteristic wide splayed articulation typical of camelids. The proximal metatarsal fragment had been chopped in an anterior-posterior direction through its lateral margin. Perhaps camel meat was occasionally eaten, although the metapodials would also have proved a useful source of bone for manufacturing purposes.

The appearance of camel at Nicopolis is not that surprising. Schramm (1975, 232) identified camel bones at the late Roman western gate and in forum deposits at Novae. It has also been reported by Bökönyi (1974) that camel bones have been found on other Roman sites in Central and Eastern Europe. He suggests that they may have come with military units transferred to the Balkans from western Asia or North Africa. However, it is likely that camels were brought into the region in pre-Roman times and they may well have been used as beasts of burden on the Black Sea coast in the Roman period.



a



b

Fig 10.5 Camel bones from Nicopolis.

a) Top: a distal metatarsal from a late Roman deposit in area D (584). b) Bottom: a proximal metatarsal from an early Byzantine level in area F (3240). Scale in cm

Dog (*Canis familiaris* L.)

Dog is attested in all but one period of the site's history. As noted above, dogs undoubtedly acted as scavengers amongst the refuse discarded by the inhabitants and must be partly responsible for some of the post-depositional damage to the assemblage.

No complete skulls or skeletons and surprisingly few complete post-cranial elements of dogs were found although two deposits contained the remains of partial skeletons or articulated limbs. A late Roman layer (P 5051) contained the partial remains of a skeleton comprising a radius, distal tibia, astragalus, calcaneus, and second, third, fourth and fifth metatarsal fragments.

The remains of a partial dog forelimb, consisting of a distal humerus, distal radius, proximal ulna and distal metapodial fragments, was also noted in a post-medieval context (A 2005). All of the above specimens were from mature, adult animals, and this was also true for the vast majority of disarticulated dog bones scattered across the site.

Withers heights for dogs were calculated using the indices of Harcourt (1974). In the late Roman period both small and medium-sized dogs were present. Whilst a radius (D 540) gave a withers height of 36.4 cm, a femur (A 2023) indicates in the case of another that it had a withers height of 62.9cm. During the early Byzantine period small-sized dogs were still popular; one tibia (E 1036) points to a height of only 32.5 cm.

The wide range of sizes and breeds of dogs is typical for a Roman site. Medium-sized dogs may have been used for hunting and perhaps the smaller ones were domestic pets. None of the dog bones showed any traces of butchery cuts or chop marks, even though dog meat was occasionally eaten in the Roman period.

Cat (*Felis domestica Schreb*.)

Several cat bones were identified amongst the Nicopolis assemblage. According to the diagnostic criteria of Kratochvil (1973, 1976) these would appear to be from domestic rather than wild cats. The bones largely belonged to adult individuals with only two exceptions: an unfused distal humerus fragment from a mid Roman deposit (D 667), and a neonatal mandible (R 5210), with the teeth still erupting, came from an early Byzantine context. All the cat bones were single finds with the exception of a pair of mandibles and 1st phalanx (C 4209) and the partial remains of an adult skeleton (E 1110) of late Roman date. No traces of cut marks were found on any of the cat bones so it seems likely that the animals were not skinned. Probably, cats were popular pets and would also have fulfilled an important role in controlling mice and other small rodents. Their presence has been noted on many sites dating to the Roman imperial period, and the Romans are known to have helped spread the species throughout Europe (Bökönyi 1974, 311).

THE WILD FAUNA

Red Deer (*Cervus elaphus* L.)

After brown hare, red deer is the most common wild animal found at Nicopolis. The species was usually indicated by the discovery of antler fragments. Antler was a valuable material and would have been collected for the manufacture of tools and other objects. Most of the pieces bore traces of saw and chop marks, suggesting that they had been used for the production of blanks to be turned into utilitarian or perhaps decorative objects (see above, worked bone, p. 79). A particularly fine example, from an early Byzantine context (E 1036), was a very large antler rose fragment, still attached to the skull, with traces of numerous saw and chop marks to its base. This had belonged to a large stag; it seems that large males were occasionally hunted in the region. The majority of the red deer post-cranial elements found were metapodials and phalanges; it may be that, as a rule, entire red deer carcasses were not brought to Nicopolis. Instead, skulls, with their antlers still attached, may have been cut off the deer immediately after a kill and then carried to the city as hunting trophies or simply as raw material for antler working. The relatively large number of metapodials and phalanges could be explained if deer were usually skinned immediately and the skins, with the feet still attached, were thentaken on to the city.

Roe Deer (*Capreolus capreolus* L.)

Three fragments of roe deer were identified in the Nicopolis assemblage. An antler tine fragment came from a late Roman deposit (B 248). An antler fragment, chopped from a skull, was found in an early Byzantine context (D 548), and a maxilla fragment from a post-medieval level. All of these fragments were from adult individuals. No post-cranial material was positively identified in the assemblage. It is

possible that, as suggested in the case of red deer, antlers may have been deliberately collected as raw material for manufacture and entire carcasses may not have been regularly brought back to the city.

Brown Bear (*Ursus arctos* L.)
Two bones of brown bear were found. Both were second phalanges. One came from a late Roman context (B 243), the other from an early Byzantine deposit (E 1036). The presence of brown bear suggests that these animals were occasionally hunted in forests not far from the city. The fact that only phalanges have been found again means that it is not certain whether the animals themselves were brought into the city. The paws may have been collected as trophies or used as some form of amulet. Another possibility is that bear rugs with the paws and feet still attached, may have been used at Nicopolis.

Wild Boar (*Sus scrofa* L.)
Fourteen bones of wild boar were found. These were all from fully mature, adult animals. Only a few of the bones could be used to estimate the size of the animal, using the indices of Teichert (1969). A mid-Roman deposit included a calcaneus which indicated a withers height of 91.8cm. An early Byzantine deposit included an astragalus which indicates that this specimen had a withers height of 102.0cm. No doubt, wild boar was also hunted in forested areas not far from Nicopolis.

Badger (*Meles meles* L.)
Three badger bones came from the assemblage. A distal humerus fragment was found in a late Roman deposit (R 5218), and a mandible and scapula fragment in a post-medieval context (C 4088). All of the specimens were from fully mature, adult individuals. Badger could well have been hunted for its fur, although it may also have been eaten.

Fox (*Vulpes vulpes* L.)
A fragment of the mandible of an adult fox was identified in a late Roman deposit (P 5051). Although foxes may have been hunted for their fur, it is possible that this specimen may not be ancient; foxes often die in their burrows, deep underground. The mandible in question looked fresh so it might be modern and intrusive.

Beaver (*Castor fiber* L.)
Six beaver bones were found during the excavations. A late Roman deposit produced a proximal femur fragment (B 243); early Byzantine contexts contained a lower molar fragment (B 210) and an astragalus (D 511), and post-medieval levels included a mandible (K 4479), distal humerus fragment (M 4805) and a femur (F 3195).

All of these specimens were from mature, adult animals. None of the bones showed clear traces of butchery marks to prove these beavers had been skinned, although this animal would undoubtedly have been hunted for its fur, and perhaps occasionally eaten, as appears to have been the case at Dichin (Poulter 1999b, 177). Kinkel observed that the proto-Bulgarians, who lived around the Volga, ate the meat of squirrels, hares and beavers, but that the Slavs did not since they regarded it as unpalatable and were surprised that the Romans considered these animals edible (cited in Boev, 1958, 436). Cosmas Indicopleustes, in his 'Christian Mythology,' notes that beaver was abundant in the Byzantine provinces around the Black Sea in the sixth century (cited in Boev, 1958, 440), so its appearance at Nicopolis is not surprising. Beavers could still be found in the Danube Basin and along its tributaries down to the end of the 19th century so its discovery in 18th/early 19th century levels at Nicopolis is of some interest, as it may represent one of the last records of this species in the region.

Mustelidae, indeterminate
Six bones were identified as belonging to mustelids, probably a species of polecat. A number of mandible fragments came from late Roman deposits (F 3361, K 4507, K 4516 and P 5018), and a post-

medieval context (K 4479) produced a distal humerus fragment. All these specimens were from mature, adult animals. The fact that mostly mandibles were present could be because the polecats were hunted for their fur and that the mandibles were waste discarded during processing the carcasses. Unfortunately, none of the bones showed any traces of skinning cut marks which would have supported this interpretation.

Brown Hare (*Lepus europaeus* Pall.)

Brown hare is the most common wild species found at Nicopolis. It is well established that hunting hares was popular during the Roman period. The majority of animals killed were mature adults; only three bones of immature individuals were identified. A complete range of anatomical elements were represented which suggests that the dead animals were brought back to the site where they were butchered and their bones discarded along with other domestic waste. The few hare bones, complete enough to be measured, suggested that the majority of animals were of a similar size.

Spur-Thighed Tortoise (*Testudo graeca* L.)

There were two finds of spur-thighed tortoise, both of late Roman date. A single carapace fragment came from area B (250), and an almost complete carapace from area P (5022). This latter specimen was identified as belonging to *Testudo graeca* because it had a single suprocaudal plate (Arnold and Burton 1978). It came from a soil build-up which accumulated when the area had been abandoned and possibly given over to cultivation during the 4th to 5th centuries, before the construction of the early Byzantine fortifications (Poulter 1995, 211). Of particular interest, as regards this complete tortoise carapace, is the fact that a small hole, 4.5 mm in diameter, had been drilled through the centre of its suprocaudal plate (Fig 10.6). Presumably, this was done so that the animal could be tethered to prevent it escaping, perhaps because it was kept as a domestic pet.



*Fig 10.6 Spur-thighed tortoise (*Testudo graeca*) carapace with a 4.5mm diameter hole drilled through its suprocaudal plate, from a late Roman deposit in area P (5022). Scale in cm*

Discussion

Animal Husbandry from the Roman to early Byzantine period

The only obvious change suggested by the bone assemblage is the increasingly important role of pig-keeping in the economy of the ancient city. During the earliest period, in the first half of the 2nd century, there would seem to have been broadly equal amounts of pig and sheep/goat, closely followed by cattle. However, from the late 2nd to early 3rd centuries down to the final destruction of the site at the end of the 6th century, in general the amount of pig bones increases whereas there was a corresponding decrease in the frequency of other domestic mammals; sheep/goat falling by *c* 15–40% and cattle by *c* 50%. Perhaps the trend towards increased pig-keeping represents the implementation of a deliberate economic strategy by the inhabitants of the ancient city.

The prosperous development of Nicopolis down to the Severan period would seem to have come to an end by the middle of the 3rd century when the region suffered during the Gothic invasions

(Poulter 1995, 12–13). Nicopolis was directly threatened during the Gothic invasion led by Cniva in 250 and was also besieged in 270 although it is uncertain whether or not the city was captured and sacked (Poulter 1995, 13–14). Even so, the Roman city survived into the 4th century and was only finally destroyed and abandoned towards the middle of the 5th, probably during the invasion of Attila in 447 when the neighbouring city of Marcianopolis is known to have been sacked by the Huns (Poulter 1995, 34). Although Nicopolis still existed in the 4th century, it faced particular difficulties; the Christian Goths, under their leader Ulfila were settled in the city's territory in 347–8 (Poulter 1995, 15). Jordanes in his Gothic History refers directly to the economy of these new settlers (*Getica* L1, 267):

> There were other Goths also, called the Lesser, a great people whose priest and primate was Ulfila, who is said to have taught them to write. And today they are in Moesia, inhabiting the Nicopolitan region as far as the base of Mount Haemus. They are a numerous people, but poor and unwarlike, rich in nothing save flocks of various kinds and pasture-lands for cattle and forests for wood. Their country is not fruitful in wheat and other sorts of grain. Some of them do not know that vineyards exist elsewhere, and they buy their wine from neighbouring countries. But most of them drink milk

In 378, shortly before the Battle of Adrianople, hostile Goths were stationed close to Nicopolis (Poulter 1995, 15–16). These were troubled times; the Danubian provinces, and in particular Moesia and Thrace, suffered more than thirty invasions and civil wars during the 3rd to 4th centuries (Lewit 1991, 87).

An increased dependence upon pig-keeping could have been an attempt to adapt to changed circumstances. Successive raids and attacks on the city from the 3rd century would certainly have meant that keeping large herds of cattle or flocks of sheep was a less attractive proposition; animals outside the city, in the countryside, could have been easily stolen. Pasture around the city would not be available when the city was under siege. However, pigs could have been easily bred and fattened in backyards or in pens within the defences, and would not have required pasturing as much as cattle and sheep. Also, pigs are well-known for their fecundity and ability to farrow at almost any time of year, and pig-keeping would have been the best means of optimising meat production. Pig-keeping continued to be important during the early Byzantine period. The new city may have even become a centre for meat production in which the rearing of pigs was still more efficiently organized, possibly in the production of specialised joints of meat, such as salted or smoked hams. Cattle and sheep appear to have been consumed at Nicopolis but were probably reared in the countryside, away from the city.

Comparison with other sites in the region

Unfortunately, there exists comparatively little information about bone assemblages from villa estates or other rural sites in the hinterland of the city. The information that we do have about villa sites suggests that they varied in size and plan, ranging from large courtyard complexes, such as Montana villas 1–3, smaller peristyle villas, such as Madara and Dolna Kremena to smaller and simpler structures, such as Prisovo and Mogilets (Poulter 1983, 86, Dinchev 1997). In the villa Montana 2, during the first period of occupation, towards the end of the 2nd century A.D., sheep, pigs and cattle were kept (Poulter 1983, 89). Quern stones are relatively common finds on rural settlements and smaller villas, confirming that small landholders were also engaged in cereal production during the 2nd and early 3rd century. During the 4th century, the villas around Montana had substantial 'horrea' (granaries), indicating that some villas were then engaged in large scale cereal production (Poulter 1983, 89). Hunting was also carried out and Prisovo, in the foothills of the Stara Planina, has produced bones of wild boar and red deer (Poulter, 1983, 89). The relief of C. lulius Quadratus from Ulmetum in the Dobrogea, depicts the ploughing of fields and the tending of flocks of sheep, suggesting that a mixed agricultural and pastoral economy was probably typical of villa estates in the 2nd to 3rd centuries (Poulter, 1983, 89). Unfortunately, these examples shed very little light on the character of animal husbandry during the Early Empire and tell us nothing at all about the late Roman period. Only the excavation of new sites, accompanied by the systematic recovery and detailed analysis of their faunal assemblages, will begin to provide reliable information about the relationship between Nicopolis and its rural hinterland. The

forthcoming publication of the results from Dichin, a site only 15km to the west of Nicopolis, will at least represent a major advance in our understanding of the economy and environment for another late Roman to early Byzantine site in the same region (see introduction, p. 14).

Probably, some cattle and sheep were grazed in the open land around Nicopolis and may have been pastured in the meadows down on the floodplain of the river Rositsa. Cattle and horses may have been used as traction animals for ploughing or pulling wagons. The discovery of beaver suggests that aquatic resources were exploited, an inference confirmed by the analysis of the fish and bird bone assemblages (see below, p. 236 and p. 253). Although the immediate region today is largely open agricultural land and lacks tree cover, during Antiquity there must have been more extensive woodland and forests near by, where red deer, roe deer and wild boar were occasionally hunted. Since hare was clearly another item on the menu, it seems that hunting was also carried out in open country, probably closer to the city.

When comparing Nicopolis with published faunal assemblages of a similar date from elsewhere in Bulgaria, a number of similarities and interesting differences can be identified (Table 10.24 and Fig 10.7). As noted in the introduction, the Nicopolis bone assemblage represents one of the largest ever analysed for the Roman, late Roman and early Byzantine periods on the lower Danube. The only comparable sites are those of Novae and Iatrus, both situated to the north of Nicopolis on the Danube. The long series of excavations, carried out by the Polish archaeological mission at Novae (Svishtov), have reported a combined total of 9,078 mammal bones, most of the material coming from area 10, the forum/Christian basilica and bishop's residence and from area 5, the western gate (Schramm 1975, 1979, Makowiecki and Schramm 1995, Makowiecki 1999, Gręzak and Lasota-Moskalewska 1996). The animal bones recovered during the 1970–72 excavations at Iatrus (Krivina) have also been published (Bartosiewicz and Choyke 1991). Here a total of 2,127 mammal bones were identified to species. Recently, A. Hammon and C. Johnstone have been studying the mammalian fauna from the late Roman and early Byzantine fortress at Dichin (introduction, p. 14). The material is still being analyzed and I am grateful to Mr Hammon for providing preliminary details in advance of publication. The assemblage so far analyzed comprises 4,136 mammal bones. The only other site which has produced published fauna of the same period is a villa in the Strouma Valley, Bela Voda, near Pernik (Iliev *et al* 1992). Here, 392 mammal bones were identified to species. The only other published assemblage of note is that from the Roman town of Ratiaria (Archar) in north western Bulgaria (Iliev *et al* 1993), where 126 mammal bones were identified to species.

In general terms, all these sites have broad similarities with the assemblage from Nicopolis. Domestic animals predominate and only low numbers of wild species were identified (Table 10.24). Camel bones were also found at Novae, in the Western Gate Sector (2nd–6th century) and in the Central Sector (2nd–6th century). Horse, dog and cat were present on all sites in low numbers, as at Nicopolis. Small quantities of ass bones were identified at Novae (west gate), at Bela Voda and Ratiaria. Red deer and wild boar were the most commonly hunted wild species on all sites. Roe deer was also noted at Dichin, Novae and Ratiaria. Beaver bones were found at both Dichin and Novae. Bones of mustelids were recorded at Bela Voda and Dichin. Fox was noted at Bela Voda, Dichin and Novae. Bones of hare were reported from Bela Voda, Dichin and Novae.

Figure 10.7 compares the proportions of the major domestic species from all these sites. There is some variation in the proportions of bones identified amongst the major species. Iatrus (late 4th–late 5th century) had large quantities of cattle (67–72%), but low amounts of pig (15–20%) and sheep/goat (13%). Other sites, like Bela Voda, Novae and the earliest and latest periods at Iatrus (early 4th century, and late 6th century) still produced assemblages dominated by cattle, but in lesser amounts (39–48%), when pig (20–38%) and sheep/goat (20–32%) were more common. Nicopolis, on the other hand, has higher amounts of pig (37–53%) and sheep/goat (30–37%) and low amounts of cattle (17–27%). It is interesting to note that the only other sites with a similar high proportion of pigs are the nearby site of Dichin and two areas at Novae; the basilica/bishop's residence and on the site of the *scamnum tribunorum*. Possibly, as with faunal assemblages from castle sites in medieval Europe, pigs and a pork diet may have been associated with high status and wealth. Some of these variations may

Table 10.24 Quantification of mammal bones from roman and late roman sites in Bulgaria and neighbouring regions (nisp values)

SITE	Bela voda	Dichin	Iatrus					Novae						Ratiaria
REFERENCE	Iliev et al. 1992	Hammon, pers.comm	Bartosiewicz & Choyke 1991					Schramm, 1975,1979			Makowiecki & Schramm 1995	Lasota-Moskalewska (in press).	Makowiecki 1999	Iliev et al. 1993
PERIOD / AREA			Period A	Period B/C	Period >C	Period D	Period MA	Area X Forum	Area IX Northern Gate	Area V Western Gate	Section X, hectare XVI and XVII, Basilica & bishop's residence	Principium	Scamnum tribunorum	
CENTURY	3rd - 6th	5th – 6th	Early 4th	Late 4th/early 5th	5th	Late 5th	Late 7th	2nd-6th	2nd-6th	2nd-6th	2nd – 8/9th	2nd half 1st	3rd-6th	2nd – 4th
DOMESTIC MAMMAL														
Camel (*Camelus* sp.)	-	-	-	-	-	-	-	27	-	19	-	-	-	-
Horse (*Equus caballus* L.)	18	56	4	22	6	18	2	77	17	160	43	14	15	7
Donkey (*Equus asinus* L.)	2		-	-	-	-	-	23	-	5	-	1	-	1
Cattle (*Bos taurus* L.)	138	978	56	389	376	468	33	1596	126	663	541	119	197	47
Pig (*Sus domesticus* Erxl.)	126	1544	41	83	82	144	14	1224	82	417	779	61	272	14
Sheep/Goat (Caprinae)	66	998	17	43	48	65	22	1219	59	372	465	22	137	36
Sheep (*Ovis aries* L.)	-	123	9	21	14	17	-	-	-	-	-	-	-	-
Goat (*Capra hircus* L.)	-	49	3	4	6	9	-	-	-	-	-	-	-	-
Dog (*Canis familiaris* L.)	7	39	-	7	2	15	2	49	4	38	21	-	3	8
Cat (*Felis domestica* Schreb.)	3	18	-	-	-	-	-	11	-	6	1	-	2	1
TOTAL DOMESTIC	**360**	**3805**	**130**	**569**	**534**	**736**	**73**	**4226**	**288**	**1680**	**1850**	**217**	**626**	**114**
WILD MAMMAL														
Brown bear (*Ursus arctos* L.)	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Red Deer (*Cervus elaphus* L.)	6	101	9	21	8	32	-	20	7	33	15	1	16	5
Fallow deer (*Dama dama* L.)	-	4	-	-	-	-	-				5	-	10	3
Red/Fallow deer (*Cervus/Dama*)	-	13	-	-	-	-	-				6	1	20	4
Roe Deer (*Capreolus capreolus* L.)	-	50	-	-	-	-	-	2	4	-	3	-	2	-
Wild Boar (*Sus scrofa* L.)	16	17	1	4	3	7	-	18	-	10	-	-	-	-
Beaver (*Castor fiber* L.)		16	-	-	-	-	-	-	-	-				
Badger (*Meles meles* L.)	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Weasel/Stoat (*Mustela nivalis/erminea* L.)	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Marten (*Putorius* sp.)	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Fox (*Vulpes vulpes* L.)	1	1	-	-	-	-	-	2	-	1	1	-	-	-
Hare (*Lepus europaeus* L.)	7	25	-	-	-	-	-	2	-	1	1	1	8	-
Rabbit (*Oryctolagus cuniculus* L.)	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Common mole (*Talpa europaea* L.)		1	-	-	-	-	-	-	-	-	-	-	-	-
Eastern hedgehog (*Erinaceus concolor* L.)	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Souslik (*Spermophilus* sp.)	-	16	-	-	-	-	-	1	-	-	-	-	-	-
Rat (*Rattus* sp.)	1	53	-	-	-	-	-		-	-	-	-	-	-
Rat/Water vole (*Rattus/Arvicola* sp.)	-	10	-	-	-	-	-		-	-	-	-	-	-
Shrew (*Sorex* sp.)	-	4	-	-	-	-	-		-	-	-	-	-	-
Unknown small rodent	-	8	-	-	-	-	-		-	-	-	-	-	-
TOTAL WILD	**32**	**331**	**10**	**25**	**11**	**39**	**0**	**45**	**11**	**45**	**31**	**3**	**56**	**12**
GRAND TOTAL	**392**	**4136**	**140**	**594**	**545**	**775**	**73**	**4271**	**299**	**1725**	**1881**	**220**	**682**	**126**

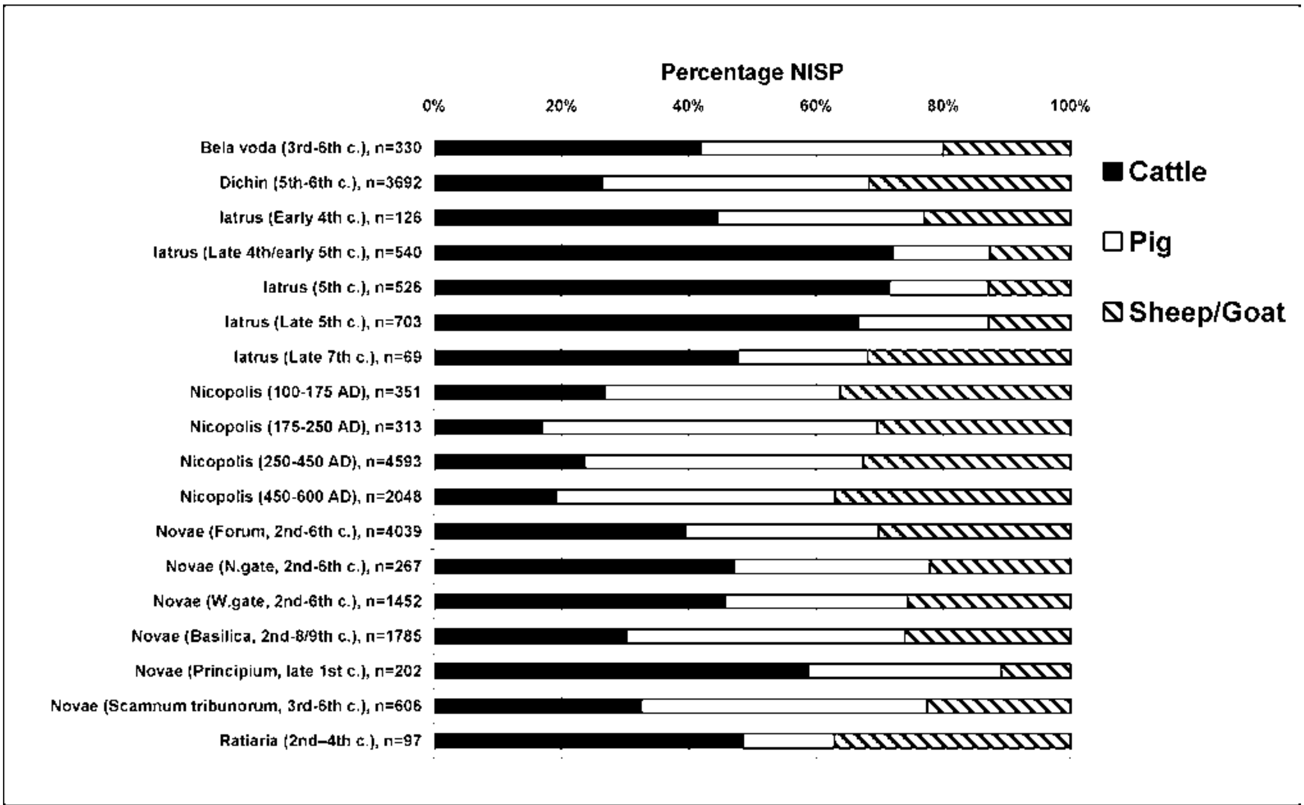


Fig 10.7 Comparison of the major mammal species at Roman, late Roman and early Byzantine sites in Bulgaria

be explained by differences in intra-site function but the marked contrast between the late 4th to late 5th century at Nicopolis and Iatrus is quite striking. This could mean that the two sites acted as production centres, that at Iatrus specialising in the production of beef and Nicopolis in pork or it could be that the inhabitants of these two sites had very different dietary preferences. Certainly, as Bökönyi points out in his survey of the rank order of species frequencies from well-documented bone assemblages of the Roman period in Western and Central Europe (Bökönyi 1984, 16), cattle dominate the majority of assemblages, followed by pig or sheep/goat in variable proportions. Iatrus would therefore seem to conform with the norm and provides similar evidence to such sites as Gorsium (Tac) in Pannonia and other sites in Western Europe, whereas Nicopolis is closer to those rarer kinds of site in the Roman Empire where pork consumption was conspicuously more important.

King has recently supplemented his earlier analyses of faunal assemblages in Roman Britain, Gaul and Germany with a regional analysis for the Roman Empire as a whole (King 1999, 1978, 1984, 1988). He points out that there are few published bone assemblages from the Danubian and Balkan provinces:

> '...beef was the most common element, with most of the sites having 60% or more cattle bones. No sites had high percentages of pig and only one, a military establishment at Porolissum (Livovschi-Chelesanu and Gudea 1996), had significant numbers of sheep and goat bones.' (King 1999)

This is plainly not true for Nicopolis, Dichin and parts of Novae, which had what King would describe as a 'high pig pattern.' Various factors could account for this situation but the most likely is the question of status. King has pointed out that the Roman 'high pig pattern' was probably connected with a high-status diet, which included the consumption of unusually large quantities of pork and especially young pigs. The pork-rich 'Roman' diet was rare across the empire as a whole. One interesting example is the Settefinestre villa in Italy, where intra-site analysis suggested that the higher status parts of the site had a higher percentage of pig bones than areas believed to have been occupied by inhabitants of lower status, such as slaves (King 1988, 52–3). Pork, particularly young pork and

suckling pig, was valued highly and therefore became part of a high-status diet. Rome, Ostia and other Italian towns tended to have pork-rich meat diets, presumably because this meat was favoured by the inhabitants who could obtain supplies from villas which engaged in fairly intensive raising of animals to cater for the demand.

In the case of Nicopolis, it has been suggested above that a growing dependence on pork may have been part of a survival strategy to ensure a regular food supply in times of danger, especially in the 3rd century and on into the early Byzantine period. However, an alternative explanation might be that young pigs were brought to the site to supply an urban elite. Unfortunately, until the results of The Transition to Late Antiquity programme are fully published (see introduction, p. 14), we have insufficient evidence from Nicopolis' territory to explain this remarkable dominance of pork over beef in the diet of the inhabitants.

Conclusions

The faunal assemblage from Nicopolis does provide information on the kinds of domestic species consumed by the inhabitants of the city and the husbandry practices used to manage them. Older cattle would have been used as dairy cows or perhaps as plough oxen. The killing of young calves represents the culling of surplus animals for veal. Pigs clearly played an important role and were regularly slaughtered at different ages. There is evidence for the organised production of livestock and the preparation of joints or shoulders of ham. Sheep were kept for their milk and wool and were usually slaughtered when they were considered to be no longer productive. Young sheep, which were surplus to breeding requirements, would have been slaughtered for their meat. The discovery of neonatal pigs suggests that breeding of pigs may have occurred in the city. Certainly the pig bones, with characteristic trauma to the distal ends of their legs, suggest that the animals were tethered by their hind legs (Boessneck *et al* 1971). Although a very small quantity of neonatal sheep was identified, in general cattle and sheep appear mostly to have been consumed rather than reared at Nicopolis, probably because they were more usually reared in the countryside, away from the city.

The faunal material has produced direct evidence for the manufacture of bone objects. Since cattle and sheep would seem to have been brought to the site 'on the hoof,' certain activities, such as horn removal and skinning, may have been carried out at particular sites. The removal of horns and hornworking, for example, may have been carried out in the south-eastern part of the site during the early Byzantine period, judging from the cache of horncore waste disposed of in the drain in area E. If horn working and tannery activities were taking place these are likely to have been located close to the river. Signs of other activities, such as the preparation of skins, were also detected in areas B, D and R.

Wild animals were of relatively little importance at Nicopolis. Domestic livestock were probably central to the economy, although hunting for wild animals clearly did take place and probably played a supplementary role in providing a varied diet. Though hunting was no doubt regarded as essentially a sport and not a regular source of food, it would have provided other natural resources such as antlers and skins.

The animal bones provide some indications as to the local ecology. The wild mammal species recorded in the Nicopolis assemblage suggest that open, wooded and riverine environments existed in the vicinity and were regularly exploited. Some of the species present may have been brought in by hunters returning from wooded areas along the valleys of the Rositsa and Yantra. Red and roe deer antlers provided valuable raw material for bone working and for the production of artefacts and tools. Wild boar were also hunted, presumably in woodland or forested river valleys. The appearance of beaver is of some interest, especially as this species is now extinct in the region. Its presence in post-medieval deposits in areas F, K and M represents the latest evidence for its survival in Bulgaria before its extinction.

The analysis of the bone assemblage provides a valuable insight into the economic practices, as well as the daily life and environment of the city from the Roman to early Byzantine periods. It is to be

hoped that future excavations will yield more evidence from rural sites in the region, and that the systematic recovery of faunal material and its subsequent detailed analysis, will shed further light on the relationship between Nicopolis and its hinterland.

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The villagers of Nikiup were so hospitable to us during our time at Nicopolis, and I would like to thank Baba Rosa Stoencheva and her family for allowing me to stay in their beautiful house in the village.

Finally, this report is dedicated to Maria, my wife, whom I first met on the Nicopolis excavation in 1986, and who continues to put up with my love of archaeology and old bones!

APPENDIX 10.1. BIOMETRIC CATALOGUE

All measurements follow the criteria of von den Driesch (1976), and are given in millimetres.

Bd	(Greatest) breadth of the distal end
BFd	(Greatest) breadth of the *Facies articularis distalis*
BFp	(Greatest) breadth of the *Facies articularis proximalis*
BG	Breadth of Glenoid cavity (scapula)
Bp	(Greatest) breadth of the proximal end
BT	(Greatest) breadth of the Trochlea
DC	(Greatest) depth of the *Caput Femoris* (femur)
Dd	Depth of the distal end
Dl	(Greatest) depth of the lateral half (astragalus)
Dm	(Greatest) depth of the medial half (astragalus)
Dp	Depth of the proximal end
GB	Greatest breadth (equid astragalus)
GH	Greatest height (equid astragalus)
GL	Greatest length
GLC	Greatest length, measured to caput (femur)
GLl	Greatest length of the lateral half (astragalus)
GLm	Greatest length of the medial half (astragalus)
GLP	Greatest length of the *Processus articularis* (scapula)
LA	Length of the Acetabulum on the rim (pelvis)
LG	Length of the Glenoid cavity (scapula)
Ll	Lateral length (equid longbones)
LmT	Length of the medial part of the *Trochlea tali* (equid astragalus)
SD	Smallest breadth of the diaphysis
SLC	Smallest length of the *Collum scapulae* (scapula)

Horse (*Equus caballus* L.)

Element Scapula

Period	Context	LG	BG
3	C/4032	59.7	50.4

Element Humerus

Period	Context	GL	Ll	SD	BT
1	D/699				81.4
4	A 2118	285.0	285.0	34.8	73.0
4	A 2118			30.9	68.2

Element Radius

Period	Context	GL	Ll	BFp	Bp	SD	BFd	Bd
3	B/213			72.5	77.8			
4	A 2118	342.6	325.0	75.1	82.5	36.0	67.1	75.1

Element Metacarpal

Period	Context	GL	Ll	Bp	Dp	SD	Bd
3	A 2235	202.5	198.0	52.3			49.3
3	B 247			50.5			
4	A 2011	233.0	227.0	51.8			49.7
4	A 2118	220.0	209.0	47.3	31.5	32.3	46.0
4	A 2118	224.0	212.0	49.5	33.6	34.3	49.0
4	D 607			46.7			

Element Pelvis

Period	Context	LA
4	A 1088	67.4

Element Femur

Period	Context	SD
3	B 243	25.8

Element Tibia

Period	Context	GL	Ll	SD	Bd	Dd
1	A 2281	360.0	332.0		80.1	48.6
1	A 2281	370.0	340.0	45.0	79.7	49.2
4	A 2118	374.0	339.0	39.2	64.5	47.9

Element Astragalus

Period	Context	GH	GB	LmT	BFd
3	A 2170	49.1		47.0	
3	B 243	55.7	58.0	57.2	46.5
3	B 244	59.8	54.6	57.3	
3	B 249			55.5	54.0
4	A 2014	60.0	61.2	63.1	55.2
4	D 542	60.3	63.4	61.5	

Element Calcaneus

Period	Context	GL
2	C 4061	107.5
3	R 5218	111.0
4	E 1073	112.2

Element Metatarsal

Period	Context	GL	Ll	Bp	SD	Bd
2	D 676			45.7		
3	A 2023					54.4
3	A 2193					52.0
3	B 244	266.2	257.0	46.4	32.0	
3	C 5306	277.5	264.0	53.3		51.4
4	E 1101		267.0	51.1		

Element 1st Phalanx

Period	Context	GL	Bp	SD	BFd	Bd
3	B 213	82.1		35.4		43.3
3	B 244			33.3		
3	B 246		52.1			
3	C 130	92.0	57.6		46.9	54.0
3	D 581	79.9	53.4			
4	A 2011	89.5	54.1			
4	A 2118	84.5	51.2			
4	E 1024		51.8			
4	E 1101	83.8	59.3			

Element 2nd Phalanx

Period	Context	GL	Bp	SD	Bd
1	A 2245		53.8		
3	A 2017				47.1
3	D 537	48.5			
3	F 3297	52.0	56.7	46.9	51.5
4	E 1107	47.9	49.4		

Ass (*Equus asinus* L.)

Element 2nd Phalanx

Period	Context	GL	Bp
3	P 5018	37.9	38.3

Cattle (*Bos taurus* L.)

Element Scapula

Period	Context	GLP	LG	BG	SLC
1	A 2245				57.5
1	B 258				40.8
3	A 2040				50.1
3	C 123	71.7	61.0	42.3	48.8
3	C 151	61.1	50.4	44.7	
3	C 4013	67.5	50.4	42.5	
4	A 2011	68.3	58.6	46.6	
4	D 550	81.8			
4	E 1036	70.0			
4	E 1036				51.3

Element Humerus

Period	Context	BT	Bd
3	B 244	58.8	
3	B 244	60.3	
3	B 247		85.0
3	B 248	57.1	
3	B 250	77.1	86.9
3	B 250	90.8	
3	C 130	69.5	79.0
3	F 3353	66.9	74.2
3	F 3353	82.7	91.3
4	A 2011	78.5	86.0
4	A 2014	80.6	90.2
4	E 1073	79.1	
4	E 1078		77.7
4	K 4498	73.0	
4	K 4502	79.7	83.6

Element Radius

Period	Context	GL	Bp	SD	Bd
1	A 2260				
1	B 267				
3	A 2017	287.8	77.0	39.6	71.1
3	B 243		60.3		
3	B 243				70.7
3	B 249		58.5		
3	B 249		64.7		
3	B 280				80.5
3	C 130		85.7		
3	C 5306				86.8
4	A 2014		87.3		
4	A 2135				67.2
4	E 1101		70.5		
4	K 4502	312.4	85.5		80.8

Element Tibia

Period	Context	GL	Bd	Dd
1	A 2245		76.8	59.5
1	A 2260		65.7	45.5
1	D 699		58.5	
2	D 667		67.2	47.8
3	B 243		56.9	
3	B 243		64.5	46.2
3	B 317		58.6	
3	C 123		65.1	48.5
3	C 130		53.4	
3	C 4033		51.0	38.0
3	D 559		57.8	42.2
3	D 610		68.4	52.8
3	F 3366		69.0	49.2
4	A 2251	315.0	56.0	
4	D 445		67.5	48.7
4	D 475		65.6	47.9
4	D 573		63.8	46.4
4	E 1072		62.7	43.5
4	E 1088		59.0	

Element Astragalus

Period	Context	GLl	GLm	Dl	Dm	Bd
1	A 2260	57.0	53.0	30.4	30.7	
1	A 2269	67.0	63.5	36.6	38.5	44.0
2	D 667	68.8	63.8	39.2		
2	D 672	63.5	58.9			
3	B 213	66.0	64.0			
3	B 243	73.9	67.5			47.4
3	B 247	61.2	57.7			
3	B 247	63.9	59.5			
3	B 247	66.0	61.1			
3	B 247	70.5	67.0			
3	B 295	59.0	55.0	31.7	34.3	37.6
3	C 126			35.1		
3	C 129	66.5	60.1	36.4		
3	C 130	57.6	53.0	33.3	32.5	
3	C 151	64.3	60.0			
3	C 4032	60.5	57.2	32.1		
3	C 5301	63.7				
3	D 559	59.7	56.7			
3	D 564		63.5			
3	D 581	71.6	67.9	39.9		
3	D 656	73.1				
3	E 1134	59.5	55.4	33.6		
3	F 3288	67.4		36.1		45.8
3	F 3356	71.4	66.6	39.5		
3	F 3364	67.8	63.9			
3	P 5051	69.5	57.1	35.0	35.3	39.9
4	D 445	61.5	57.6	35.7		
4	E 1078	58.2	54.6			
4	E 1078		59.4			
4	E 1101	57.4	53.7	33.3		
4	K 4498		64.0			
4	K 4502	62.9	57.4	35.7		40.6
4	K 4504	61.8	57.5	34.8		39.7

Element Calcaneus

Period	Context	GL
2	C 4061	107.5
3	D 584	133.0
3	F 3288	146.8
3	F 3291	126.8
4	K 4502	130.6

Element Metatarsal

Period	Context	GL	Bp	Dp	BT	Bd
1	A 2281					59.0
1	B 267	236.0	49.7		57.6	56.2
2	D 676		45.7			
2	D 667		48.0	47.8		
2	D 672		49.4	50.6		
2	D 676					56.6
2	P 5025		49.1			
2	P 5027					54.9
3	B 213		49.7			
3	B 244					51.8

3	B 244					53.7
3	B 244					56.3
3	B 247		43.0			
3	B 249		49.0			
3	B 249		54.0			
3	B 249					49.5
3	B 250		42.7			
3	C 123				50.2	52.9
3	C 130		50.2	46.1		
3	C 4096					59.0
3	C 4212				57.6	
3	C 4215				66.3	
3	C 5302	250.6				
3	C 5306					79.5
3	D 537				65.1	
3	D 558		44.9	42.6		
3	D 559					60.4
3	D 598		47.9	49.0		
3	D 689		46.0	48.2		
3	E 1133					57.3
3	F 3353		52.0	48.1		
3	F 3366	228.0	49.6	48.7		57.8
3	F 3366	231.0	51.7	49.1		61.0
3	P 5018					51.8
3	R 5218					56.3
4	A 2011				53.8	
4	D 445					53.6
4	E 1024		46.1			
4	F 3240				55.2	
4	K 4498	223.1	50.3		62.5	
4	K 4498		47.5			

Element 1st Phalanx

Period	Context	GL	Bp
1	A 2260	64.0	29.3
1	A 2277	56.7	27.5
1	A 2277	63.2	28.6
1	B 265	61.8	31.2
1	B 267	40.7	29.8
1	B 267	61.0	30.5
1	D 699	59.6	28.1
1	D 699	60.3	26.7
1	D 699	69.2	29.0
1	D 699	70.0	31.1
2	B 288	59.0	27.3
2	C 4118	67.9	34.8
2	C 4118	68.0	32.4
2	D 667	61.4	28.2
2	D 676	67.6	29.2
2	D 676		30.1
2	M 4866	58.8	26.2
2	P 5024	60.5	28.8
3	A 2023	57.5	30.0
3	A 2192	65.0	28.3
3	B 213	54.2	26.8
3	B 213	58.4	
3	B 213	59.7	
3	B 213	61.5	28.0
3	B 213	68.8	31.7
3	B 243	56.3	
3	B 243	60.0	27.4
3	B 243	63.0	27.2
3	B 244	56.4	29.2
3	B 244	62.4	
3	B 244	63.8	
3	B 247	55.8	24.9
3	B 247	57.4	25.9
3	B 247	57.5	31.1
3	B 247	59.4	31.6
3	B 247	60.4	26.3
3	B 247	66.5	34.8
3	B 247		35.4
3	B 248	61.4	33.4
3	B 248		30.9
3	B 249	49.3	25.8
3	B 249	57.7	30.2
3	B 249	58.0	27.5
3	B 249	58.2	29.0
3	B 249	61.7	28.3
3	B 249	63.5	
3	B 274	65.5	32.8
3	B 300	62.5	28.8
3	C 126	65.8	
3	C 130	57.7	27.3
3	C 130	60.2	29.9
3	C 130	65.2	31.4
3	C 130	66.5	29.8
3	C 151	68.5	32.4
3	C 158	63.6	32.3
3	C 4013	64.5	24.8
3	C 4013	68.3	34.7
3	C 4211	59.6	
3	C 4215	55.5	25.3
3	C 5302	53.1	30.2
3	C 5306	58.4	
3	C 5306	59.2	30.1
3	C 5306	61.0	34.5
3	C 5306	64.3	32.8
3	C 5309	63.5	32.9
3	C 5311	65.5	31.5
3	C 5316	56.5	29.8
3	D 559	63.6	28.3
3	D 570	58.5	
3	D 584	59.4	29.1
3	D 589	68.7	32.8
3	D 604	57.7	29.0
3	D 604	59.0	29.8
3	D 659	60.7	31.5
3	D 661	61.8	28.2
3	D 661	65.3	33.1
3	D 665	60.3	26.3
3	D 665	61.0	27.5
3	D 682	66.5	28.7
3	E 1110	64.5	33.4
3	E 1123	63.8	29.8
3	E 1123	64.3	
3	E 1123	68.4	30.0
3	E 1128	61.0	28.8
3	F 3288	60.7	33.0
3	F 3292	58.0	33.0
3	F 3364	58.6	26.6
3	F 3365		29.5
3	F 3366	60.5	26.1
3	M 4869	60.8	30.7
3	P 5018	58.5	29.2
3	P 5018	64.9	28.5
3	P 5018	66.1	32.2
3	P 5018	66.3	36.9
3	P 5018	66.9	31.7
3	P 5018	68.1	34.8
3	P 5019	56.0	21.7
3	P 5050	63.5	
3	P 5050	67.3	30.5
3	R 5218	57.3	31.8
3	R 5218	64.0	29.6
3	R 5218	64.2	38.3
3	S/5281		33.5
4	A 2011	57.6	27.0
4	A 2109	55.7	25.2
4	A 2110	60.9	31.6
4	A 2137	62.3	28.0
4	A 2142	54.5	28.5
4	A 2208	69.0	29.7
4	D 445	63.0	29.5
4	D 535	58.2	32.1
4	D 542	59.0	29.0
4	E 1024	51.8	25.3
4	E 1024	56.5	28.8
4	E 1036	59.0	30.1
4	E 1036	60.0	30.1
4	E 1036	60.7	30.1
4	E 1036	62.8	35.9
4	E 1036	65.8	32.4
4	E 1036	66.0	26.7
4	E 1036		29.7
4	E 1078	59.6	
4	E 1078	61.1	
4	E 1080	70.2	32.4
4	E 1087	60.7	27.4
4	E 1101	63.0	30.0
4	F 3275	62.1	28.8

Pig (*Sus domesticus* Erxl.)

Element Scapula

Period	Context	GLP	LG	BG	SLC
1	D 699				20.4
1	D 699				20.6
2	B 288	31.2			19.2
2	C 4132	33.8			
3	A 2170	41.2			26.5
3	B 243	34.8		26.0	20.4
3	B 248	31.6			21.8
3	B 249	22.6			21.0
3	B 280				20.5
3	C 123			21.9	23.6
3	C 151	33.3	29.0	23.3	22.9
3	C 151	33.3	26.5		23.4
3	C 151	35.2	28.6	21.6	
3	C 151	36.6	30.8	21.9	
3	C 4013	32.1	26.4		
3	D 558				17.1
3	D 658	31.4	25.2	19.3	22.2
3	D 661	30.3	23.0		18.4
3	D 689				26.0
3	E 1123	37.0		25.8	24.9
3	E 1134	32.0	27.1	24.0	
3	E 1191			25.8	
3	F 3292	36.1			
3	F 3364	33.7	27.2	22.8	
3	F 3365	33.6	22.0	28.3	
3	P 5018		28.8	22.5	22.8
3	P 5018			24.2	
3	P 5051	37.3			23.0
3	P 5051	37.5			
3	R 5218	32.8			
3	R 5218	35.4			
4	A 2118	30.2			
4	A 2251				19.0
4	D 525				25.1
4	D 542				15.2
4	D 542				18.8
4	D 542				23.6
4	D 607	31.0	25.3	20.9	
4	D 636	32.2	26.1	22.5	
4	D 636				20.5
4	E 1024				21.7
4	E 1087	36.5			22.7
4	K 4504				18.5

Element Humerus

Period	Context	Bp	Dp	BT	Bd
1	A 2260	49.1	63.5		
1	D 699			29.8	34.2
2	D 667			32.4	38.3
3	B 213				35.0
3	B 243			35.6	42.3
3	B 243				38.6
3	B 247				39.5
3	B 249			29.8	

3	B 250	33.5	
3	C 121	28.3	
3	C 151	33.5	37.6
3	C 4033	32.4	
3	D 537	26.6	31.1
3	D 559	34.8	42.1
3	D 559	33.2	
3	D 576	34.6	39.6
3	D 604		34.3
3	D 658	30.2	36.0
3	D 689		35.7
3	F 3288		36.1
3	F 3366	33.0	
3	P 5014	34.1	
3	P 5018	35.5	41.5
3	P 5051	35.3	
3	S/5288		35.8
4	A 2188	31.5	37.2
4	A 2218	30.6	37.2
4	D 542	35.5	41.8
4	D 636	29.0	34.2
4	E 1036	34.6	40.4
4	E 1073		35.8
4	E 1078	32.1	37.4
4	E 1078		37.6
4	E 1078		44.1

Element Radius

Period	**Context**	**Bp**	**Bd**
1	B 265	26.6	
2	B 335	26.9	
2	C 4118	26.8	
3	A 2021	32.2	
3	A 2193	30.7	
3	B 247	24.8	
3	B 247	27.4	
3	C 120	27.0	
3	C 123	30.2	
3	C 126		37.0
3	C 130	28.3	
3	C 151	28.3	
3	C 5302	26.6	
3	C 5309	26.9	
3	D 553	24.9	
3	D 576	25.6	
3	D 577	31.2	
3	D 604	25.5	
3	D 604	28.5	
3	E 1110	34.0	
3	E 1191	21.7	
3	F 3366	25.3	
3	P 5014	24.6	
3	P 5018	27.0	
3	P 5051	26.1	
3	R 5218	29.5	
3	S/5288	28.0	
4	A 2011	28.9	
4	A 2014		36.9
4	A 2130	28.0	
4	D 475	26.0	
4	D 542	28.5	
4	E 1036	25.0	
4	E 1036	27.0	
4	E 1036	27.8	
4	F 3286	28.5	

Element Metacarpal 2

Period	**Context**	**GL**	**Bp**
3	C 4211	79.0	9.4
4	A 2139	48.7	

Element Metacarpal 3

Period	**Context**	**GL**	**Bp**
3	A 2017		20.0
3	A 2193	66.7	19.4
3	B 248		16.0
3	C 130		16.5
3	C 130		21.8
3	C 5306	57.5	13.8
3	E 1191		19.0
3	P 5050	67.5	15.6
3	P 5051		17.7
3	R 5218		16.7
4	A 2117		20.2
4	A 2137	63.3	18.8
4	A 2217		18.8
4	A 2217		20.0
4	D 542	77.0	17.1
4	D 636		15.4
4	D 636		15.8
4	E 1024		18.6
4	E 1024		20.0
4	E 1024		22.9
4	E 1087		23.5
4	F 3274		15.6
4	F 3286	69.0	16.0
4	F 3286		14.7
4	K 4498	65.7	19.0
4	K 4502		15.1
4	K 4504		21.0

Element Metacarpal 4

Period	**Context**	**GL**	**Bp**
3	B 247	66.6	16.6
3	C 130		15.5
3	C 5302	68.6	14.7
3	C 5302		12.8
3	D 626	71.3	16.4
3	D 689	67.7	14.7
3	R 5218		12.1
4	A 2125		13.1
4	A 2214		14.7
4	A 2217	69.6	15.6
4	D 542		14.6
4	D 636		16.1
4	D 636		16.5
4	E 1033		15.4
4	E 1036		16.1
4	E 1036		16.7
4	E 1036		16.9
4	F 3286		13.2

Element Metacarpal 5

Period	**Context**	**GL**	**Bp**
4	A 2135	51.3	

Element Femur

Period	**Context**	**Bp**
3	P 5051	42.5

Element Tibia

Period	**Context**	**Bd**	**Dd**
1	A 2076	27.0	
1	A 2260	26.0	
1	A 2277	27.7	24.3
1	A 2277	28.0	24.2
1	A 2277	31.5	27.0
1	C 4135	25.9	
3	B 213	29.3	
3	B 241	31.2	
3	B 243	28.3	
3	B 243	31.0	
3	B 247	26.3	
3	B 249	30.3	
3	C 130	28.5	23.9
3	C 4013	28.8	24.0
3	D 553	29.1	24.1
3	D 564	30.5	
3	D 604	24.9	22.2
3	D 604	29.0	25.4
3	E 1007	29.5	26.2
3	P 5051	29.2	
3	P 5051	31.0	
3	R 5218	29.5	25.0
4	D 474	30.4	24.3
4	D 550	27.0	
4	E 1024	28.1	24.0
4	E 1024	29.2	
4	E 1034	30.2	25.8
4	E 1036	25.2	
4	E 1036	27.1	

Element Astragalus

Period	**Context**	**GLl**	**GLm**	**Dl**
3	B 241	41.3	36.2	
3	B 243	42.5	37.2	
3	B 244	37.0	35.1	
3	B 244		40.3	
3	B 247	37.8	33.6	
3	B 247	40.5	38.7	
3	B 248	38.5	35.2	
3	B 248		40.5	
3	B 249	42.0	38.1	
3	B 280	37.0		
3	B 300	42.0	38.4	
3	C 130	40.6	36.7	
3	C 151	37.4	34.9	19.7
3	C 4013		37.0	
3	C 4033	40.5		20.7
3	D 604	32.5	30.3	
3	D 635	39.2	35.0	20.7
3	E 1134	40.2	38.0	21.1
3	E 1191	39.5	36.2	
3	P 5018	36.6		
3	P 5018	37.0	33.6	
3	P 5050	37.2	34.8	
3	P 5051	39.9	36.2	
3	R 5218	40.0	36.7	
4	A 2014	42.5	38.1	
4	D 473	33.1	30.9	
4	D 542	41.2	37.8	
4	E 1011	43.0	39.8	
4	E 1024	38.5	35.9	
4	E 1034	41.2	36.8	
4	E 1036	40.0	35.7	
4	E 1078	42.2	39.7	
4	E 1078	45.4	41.3	
4	E 1078		38.4	

Element Calcaneus

Period	**Context**	**GL**
1	A 2277	75.0
3	A 2236	62.8
3	D 665	61.3
3	F 3291	58.4
3	F 3301	76.1
3	P 5018	78.1
4	A 2014	84.9
4	E 1078	82.2
4	E 1101	82.2

Element Metatarsal 2

Period	**Context**	**GL**	**Bp**
4	A 2118	50.3	

Element Metatarsal 3

Period	**Context**	**GL**	**Bp**
3	A 2017		14.8
3	A 2017		15.3
3	A 2219		13.0

3	C 133	85.3	15.2
3	C 5302		14.5
3	D 608		14.5
3	F 3297		14.0
3	R 5218		17.0
4	A 2214		13.5
4	A 2217		15.6
4	F 3219		15.2
4	S/5263		16.0

Element Metatarsal 4

Period	**Context**	**GL**	**Bp**
2	B 342		15.7
3	A 2193	82.2	
3	A 2219		12.6
3	B 244	91.2	16.9
3	D 604		13.2
3	D 665		12.8
3	D 701		13.6
3	F 3297		13.3
3	P 5051		14.5

Element Metatarsal 5

Period	**Context**	**GL**	**Bp**
4	A 2130		15.2
4	D 550		13.5

Element 1st Phalanx

Period	**Context**	**GL**	**Bp**
1	A 2260		14.0
1	C 4135	32.6	16.0
2	B 341	35.0	15.0
2	D 676	31.0	15.2
3	B 241	33.8	16.3
3	B 247	32.4	
3	B 248	34.1	16.7
3	B 248	35.9	16.1
3	C 101	35.0	14.5
3	C 120	35.6	16.1
3	C 123	42.1	15.1
3	C 126	36.8	16.4
3	C 158	37.3	16.5
3	C 158	37.9	15.0
3	C 4095	34.1	14.5
3	C 4110	36.3	14.4
3	C 4113	34.8	15.8
3	C 5302	34.2	16.1
3	D 537	30.7	15.5
3	D 540	31.4	17.2
3	D 540	33.5	16.5
3	D 559	53.1	18.6
3	D 604	33.2	16.0
3	D 613	35.2	
3	D 659	32.7	15.7
3	D 682	54.4	19.6
3	E 1123	32.0	15.0
3	E 1190	48.2	20.8
3	F 3294	32.3	16.8
3	F 3301	21.0	14.4
3	F 3301	33.5	17.3
3	P 5018	31.1	12.4
3	P 5018		12.8
3	P 5051	32.9	14.3
3	P 5051	32.9	15.8
4	A 2218	31.3	16.3
4	D 542	37.0	17.7
4	D 554	38.1	16.7
4	D 607	38.2	13.7
4	E 1036	23.3	11.8
4	E 1036	31.9	15.7
4	E 1042	36.0	16.0
4	E 1074	42.9	17.3
4	F 3219	35.5	16.8
4	F 3286	31.0	17.1

Sheep/Goat (Caprinae)

Element Scapula

Period	**GLP**	**LG**	**BG**	**SLC**
1				16.1
1	34.4			
3	36.6		22.8	
3				21.4
3				23.2
3				11.7
3	36.1			18.9
3	33.3	27.4	21.4	
3	34.3	28.1	22.1	18.3
3				20.5
3	34.2	26.8	21.1	
3	33.3			21.3
3	34.0	28.0	21.0	
3	36.8	29.7	24.3	
3	32.1	25.5	20.3	
3	32.7	25.9	21.3	18.4
4	33.4			
4				13.6
4	35.5			
4	36.8			
4	32.1	26.4	21.2	19.5
4	32.0	26.2	23.7	19.8
4	36.4	29.4	25.6	23.2
4	38.0	30.4	22.6	

Element Humerus

Period	**Context**	**BT**	**Bd**
1	D 698	35.3	37.7
2	D 677	31.4	
3	B 246	32.8	
3	B 247	28.3	
3	B 247	30.6	
3	B 247	33.2	35.4
3	B 255	31.5	34.7
3	B 311	30.5	
3	C 101	33.0	
3	C 121	33.5	34.9
3	C 130	33.7	
3	C 130		38.3
3	C 5306	30.9	31.5
3	D 558	32.4	
3	D 584	31.0	
3	D 659	31.2	
3	D 706	30.7	
3	F 3292		31.0
3	F 3356	27.2	
3	M 4871	31.8	33.6
3	P 5051	31.7	
4	D 445	33.5	
4	D 445	34.5	
4	D 542	29.6	
4	D 636	33.3	
4	E 1072	28.1	

Element Radius

Period	**Context**	**Bp**	**SD**	**Bd**
1	A 2260	26.0		
1	A 2281		19.0	
2	B 288	34.4		
2	B 335			31.3
3	B 248			33.1
3	B 250	31.6		
3	C 126			35.9
3	C 133	31.5		
3	C 5306	33.2		
3	C 5306	36.6		
3	D 577	34.0		
3	E 1191			30.5
3	F 3291			31.4
3	F 3364	32.7		
3	M 4869			30.2
3	R 5218	33.0		
4	A 2011	36.3		
4	D 542	28.5	15.6	

Element Metacarpal

Period	**Context**	**Bp**	**Dp**	**BT**	**Bd**
2	B 337			23.6	23.8
2	D 677	23.3	16.8		25.7
2	P 5029				30.5
3	A 2023	24.8			
3	B 247	28.2			
3	C 121	23.5	17.1		
3	C 121	23.9			
3	C 4507	28.3	19.5		
3	D 537	24.8			
3	D 559	26.9			
3	D 559				26.2
3	D 570	29.9	20.1		
3	D 577	27.9			
3	D 635	24.8	17.4		
3	D 689	24.0			
3	E 1110	27.1			
3	P 5051	29.0			
3	S/5282	24.2			
4	A 2112	24.8	17.9		
4	A 2145				28.2
4	D 542				28.3
4	D 607	22.4			
4	D 636	26.1			
4	E 1036	30.0			
4	E 1072	22.8			

Element Femur

Period	**Context**	**Bp**
3	B 280	44.0

Element Tibia

Period	**Context**	**Bd**	**Dd**
1	A 2277	24.6	20.2
2	P 5024	30.1	
3	A 2211	28.2	20.5
3	B 243	31.2	
3	B 244	29.1	22.2
3	B 247	29.1	
3	B 248	27.3	
3	B 249	27.2	
3	B 249	27.4	
3	B 249	27.7	
3	B 274	27.9	21.4
3	B 296	28.7	22.2
3	C 121	28.7	
3	C 123	28.0	20.4
3	C 123	31.0	23.4
3	C 123	32.4	21.9
3	C 129	24.8	
3	C 130	26.8	20.4
3	C 130	27.5	19.0
3	C 158	30.8	21.4
3	C 4013	27.0	20.6
3	C 4013	30.3	20.7
3	C 4032	29.2	22.4
3	C 4033	29.8	22.2
3	C 5306	29.0	22.2
3	D 536	29.3	21.5
3	D 543	26.3	19.3
3	D 543	28.0	21.8
3	D 559	28.1	19.5
3	D 577	29.0	23.1
3	D 581	27.1	20.8

3	D 584	29.1	21.3
3	D 661	28.9	22.0
3	D 682	24.7	19.3
3	D 682	28.5	22.7
3	F 3353	28.9	22.4
3	F 3364	26.6	
3	P 5018	25.8	
3	P 5018	27.7	
3	P 5051	30.6	
3	R 5218	27.4	21.5
4	D 445	25.9	20.3
4	D 554	30.6	23.0
4	D 573	28.6	20.6
4	D 607	26.2	21.2
4	D 607	27.7	20.9
4	D 636	26.4	20.1
4	D 636	26.9	21.1
4	E 1004	31.7	24.2
4	E 1031	31.2	25.4
4	E 1036	26.2	20.0
4	E 1036	28.2	20.6
4	E 1036	28.9	21.9
4	E 1078	30.0	
4	E 1078	30.4	
4	F 3286	26.3	

Element Metatarsal

Period	Context	GL	Bp	Dp	Bd
1	A 2277		21.5	21.1	
1	B 265		22.8		
2	D 676		22.8	20.9	
2	D 676		22.8	21.2	
2	D 676		24.0	22.6	
3	A 2021		20.4	19.7	
3	B 247		20.7		
3	B 280		20.1		
3	B 298				26.8
3	B 311		19.5		
3	C 151		21.4	21.9	
3	C 4013		20.5	19.3	
3	C 4053				25.8
3	D 544		20.6	20.5	
3	D 559		22.7		
3	D 577				26.8
3	D 581		22.8	22.3	
3	D 701	125.5	20.2	19.4	
3	D 706		22.2	19.4	25.9
3	F 3294		19.7		
3	R 5218				24.7
3	R 5218				26.2
4	A 2126		24.0		
4	A 2218		22.5		
4	D 607		21.8	20.6	
4	D 636				30.2
4	E 1078				27.1
4	F 3275		23.8		

Element Astragalus

Period	Context	GLl	GLm	Dl	Bd
1	D 699	33.8	32.0		
2	B 335		31.2		
2	C 4061	32.6	30.0		
3	B 241	34.5	31.8		
3	B 243	28.4	26.4		17.5
3	B 243	32.0	30.1		20.7
3	B 243		31.0		
3	B 244	32.2	30.4		20.2
3	B 247	28.5	26.8	15.4	18.2
3	B 247	29.3	26.9		17.5
3	B 247	31.2	29.0	18.0	21.3
3	B 247	31.5	28.4		19.8
3	B 247		31.7		
3	B 249	32.0	29.4		
3	C 125	31.8	30.2	18.4	
3	C 126	29.9	28.0		
3	C 129	26.7	25.0	14.3	
3	C 130	33.3	30.7	17.4	
3	C 130	33.5		18.5	
3	C 152	30.8	28.4		
3	C 158	31.0		17.0	
3	C 4013	30.7	28.8	17.0	
3	C 4013	31.3	30.0		
3	C 4013	32.7	29.8		
3	C 4095	30.7	29.3		
3	C 4215	31.2	29.4	18.1	20.2
3	C 4217	29.0	28.1	15.4	18.4
3	C 5302	30.1	27.8	15.8	
3	D 537	31.3	29.5	16.2	
3	D 598	31.6	30.3	17.2	
3	D 635	31.4	28.9	16.9	
3	D 659	32.0	29.6	16.8	20.7
3	D 665	32.0	29.7	16.5	20.3
3	D 682	33.4	31.2	18.0	
3	D 706	29.3			
4	A 2014	30.1	27.7		
4	D 542	32.1	29.6		
4	D 550	29.6	27.1	15.7	19.0
4	D 636	30.6	29.5	17.6	

Element Calcaneus

Period	Context	GL
3	C 121	63.0
3	C 129	60.3
3	D 661	61.0
3	D 689	58.8
3	D 704	65.5
3	P 5018	68.5
4	D 636	62.6
4	E 1036	60.2
4	K 4504	58.5

Element 1st Phalanx

Period	Context	GL	Bp
1	A 2277	37.8	13.3
2	D 672	44.3	13.5
2	D 676	43.6	13.6
2	D 676	43.8	13.8
3	B 248	38.2	11.8
3	B 250	38.3	14.4
3	B 257	41.8	12.7
3	C 101	35.1	12.1
3	C 101	41.2	14.3
3	C 101	41.3	13.3
3	C 125	48.3	15.7
3	C 126	39.2	
3	C 133	24.3	
3	C 158	41.8	12.9
3	C 4033	43.5	13.0
3	C 4057	42.5	15.4
3	C 4110	39.1	12.1
3	C 5306	36.4	13.2
3	C 5306	37.5	12.5
3	C 5306	40.0	13.5
3	C 5311	39.5	13.0
3	D 540	37.7	13.0
3	D 544	41.1	15.4
3	D 559	42.1	14.4
3	D 604	42.3	13.4
3	D 618	40.0	13.6
3	D 635	36.7	11.9
3	D 635	37.5	11.7
3	D 635	40.0	14.6
3	D 662	39.2	12.1
3	D 662	39.9	12.9
3	D 665	42.2	14.3
3	D 682	38.1	12.5
3	D 704	37.7	12.7
3	D 706	44.3	13.9
3	E 1110	41.6	13.1
3	F 3356	38.9	13.7
3	F 3356	39.6	13.2
3	P 5018	41.4	14.3
3	P 5018	42.8	14.4
3	P 5018		15.1
3	P 5019		13.6
3	P 5051	41.3	15.0
3	P 5051		13.9
3	P 5215	37.6	
3	R 5218	34.4	13.2
3	R 5218	35.5	13.4
3	R 5218	37.5	13.5
3	R 5218	41.3	13.9
3	S/5283	33.8	13.0
3	S/5288	40.3	12.7
4	A 2126	39.6	13.5
4	A 2143	42.7	13.2
4	A 2188	38.2	13.3
4	A 2251	37.5	12.2
4	D 445	36.4	12.0
4	D 525	39.6	12.5
4	D 542	35.1	12.6
4	D 542	43.5	13.8
4	D 550	42.6	12.8
4	D 636	37.4	12.6
4	E 1004	39.3	12.0
4	E 1004	44.8	14.7
4	E 1031	40.9	
4	E 1036	38.5	13.4
4	E 1036	39.6	12.6
4	E 1036	39.8	12.9
4	E 1036	40.3	12.8
4	E 1036	41.9	15.0
4	E 1088	37.3	12.8
4	E 1073		11.4

Sheep (*Ovis aries* L.)

Element Scapula

Period	Context	GLP	LG	BG	SLC
2	D 667	36.2	27.9	23.4	22.3
2	D 667	36.3	30.0	22.5	22.8
3	D 661	34.8	28.3	23.0	19.2
3	E 1075	32.1	28.0	22.9	19.8
3	E 1110	32.5	24.9	21.3	19.7
3	E 1112	36.9	29.5	23.7	22.7

Element Humerus

Period	Context	BT	Bd
1	A 2259	30.7	32.5
2	D 676	29.0	
3	A 2017	30.8	35.0
3	C 121	32.5	33.6
3	C 123	31.9	33.4
3	D 663	29.2	31.8
3	D 706	29.3	
3	P 5018	30.9	32.5
3	P 5018	31.2	31.9
4	A 2110	29.8	30.5
4	A 2123	29.3	30.0
4	D 550	32.2	
4	E 1031	32.6	34.3
4	E 1031	33.4	
4	E 1036	31.0	32.3
4	E 1080	32.9	33.4

Element Radius

Period	Context	Bp	Bd
1	D 699	34.3	
2	P 5024	28.7	
2	P 5024		29.6

3	C 121		34.6
3	D 537		38.8
3	D 665	31.4	
3	E 1075	36.8	
3	E 1110	33.0	
3	P 5018	32.8	
3	P 5051	30.4	
4	A 2188	35.8	
4	A 2188		30.7
4	D 525	37.4	
4	D 535	34.2	
4	D 550	34.5	
4	D 554	34.0	
4	D 607	32.5	
4	E 1036		32.0
4	E 1036		33.3
4	E 1101		32.4
4	E 1101	31.8	

Element Metacarpal

Period	Context	GL	Bp	Dp	Bd
2	P 5024		22.9		
3	D 665		24.4	16.0	
3	D 689	118.0	21.8	16.8	
3	E 1112		27.2	19.7	
3	F 3356		25.3	17.2	
3	M 4869	120.3	22.8	17.5	
4	A 2251		26.4	18.5	
4	D 542	117.3	25.8	18.1	28.5
4	E 1004		23.5	16.9	
4	E 1004				27.5
4	E 1073		26.8		

Element Tibia

Period	Context	Bd	Dd
1	A 2259	27.5	21.2
1	A 2260	31.0	22.5
3	B 280	29.0	22.5
3	D 665	29.1	21.7
4	A 2118	29.8	21.3
4	A 2137	31.8	25.5
4	D 550	31.5	24.3
4	E 1088	30.3	22.4
4	K 4502	28.0	22.0

Element Metatarsal

Period	Context	GL	Bp	Dp	Bd
2	P 5025	137.5	22.3		25.3
3	C 4110	140.0	21.6		26.5
3	C 5306	122.7	19.8		24.4
3	C 5306		23.3		
3	F 3288	131.8	20.2		
4	E 1009		21.8	22.1	
4	E 1024		25.3	18.0	
4	E 1036		21.3	21.4	
4	E 1036		24.1	24.4	
4	E 1036		24.7	24.5	
4	E 1036		26.0	25.7	
4	E 1101				29.5
4	K 4502		21.7		

Element Astragalus

Period	Context	GLl	GLm	Dl	Bd
3	B 280	29.6	27.4	16.0	18.2
3	B 280	31.0	29.0	17.6	19.8
3	B 300	32.5	30.5	18.0	20.6
3	E 1110	33.2	31.2	18.6	
4	D 550	33.4	30.8	18.5	21.5
4	E 1024	29.3	28.3	16.4	19.3
4	E 1031	32.3	29.8		
4	E 1031	33.3	31.2		
4	E 1036	28.2	26.1		
4	E 1036	30.5	28.6		
4	E 1036	33.6	31.0		
4	K 4498	29.2	27.9	16.3	18.7

Element Calcaneus

Period	Context	GL
3	A 2017	57.8
3	A 2023	56.8
4	E 1036	61.2
4	E 1036	61.4

Goat (*Capra hircus* L.)

Period	Context	Element	GL	GLl	GLm	Bp	Dp	SD	BT	Bd
1	D 699	Humerus							30.3	31.5
4	E 1024	Radius				34.1				
2	B 337	Metacarpal							28.5	30.5
3	C 5311	Metacarpal	110.3			26.3				28.6
3	C 5312	Metacarpal	117.0			25.3		17.6		
3	E 1123	Metacarpal								27.6
4	K 4502	Metacarpal	118.1			24.9	17.1		28.0	28.3
3	A 2017	Metatarsal				24.3	23.0			
3	D 635	Metatarsal								26.1
3	D 682	Metatarsal	122.0			21.4	19.5			24.9
3	E 1007	Metatarsal				19.1	18.7			
3	E 1110	Metatarsal				24.1				
3	E 1110	Metatarsal								25.9
4	A 2011	Metatarsal				24.0				
4	A 2217	Metatarsal				22.2	20.6			
4	E 1101	Astragalus		31.9	30.3					
4	D 542	Calcaneus	60.9							

Dog (*Canis familiaris* L.)

Period	Context	Element	GL	GLP	GLC	DC	Bp	SLC	Bd	Dd
4	A 2117	Scapula		22.1				16.4		
3	P 5014	Humerus							37.4	
4	A 2011	Humerus							31.8	
4	A 2130	Humerus							29.9	
4	D 607	Humerus							32.9	
4	E 1036	Humerus							31.1	
4	E 1036	Humerus							35.0	
3	A 2017	Radius					17.7			
3	C 4211	Radius							26.8	
3	D 537	Radius							27.6	
3	D 540	Radius	108.2				16.7		22.9	
3	D 559	Radius					32.2			
3	F 3297	Radius							17.3	
4	D 534	Radius							28.0	
4	D 571	Radius					19.9			
4	E 1024	Radius							27.0	
3	A 2193	Metacarpal2					6.3			
3	P 5051	Metacarpal2					7.6			
4	F 3287	Metacarpal5	45.7				8.0			
3	A 2023	Femur			204.6	21.1			36.0	
4	A 2011	Femur							30.7	
3	C 101	Tibia							27.2	19.4
3	C 129	Tibia							22.5	17.4
3	P 5051	Tibia							20.9	13.6
4	A 2014	Tibia					20.5			
4	E 1036	Tibia	108.0				15.2			
3	P 5051	Metatarsal2	60.3				6.2			
3	P 5051	Metatarsal3	65.0				8.4			
3	P 5051	Metatarsal4	68.0				8.4			
3	P 5051	Metatarsal5	60.0				8.3			
3	C 123	Calcaneus	45.0							
3	P 5051	Calcaneus	49.2							
4	A 2139	Calcaneus	27.5							
4	E 1036	Calcaneus	49.6							
3	A 2192	1st Phalanx	16.4				6.2			
4	D 525	1st Phalanx	30.7				11.5			
4	D 548	1st Phalanx	21.2				6.6			

Cat (*Felis domestica* Schreb.)

Period	Context	Element	GL	Bd
4	E 1073	Humerus		19.6
4	E 1080	Radius	96.3	13.2
3	C 4210	1st Phalanx	16.3	

Red deer (*Cervus elaphus* L.)

Period	Context	Element	GL	Bp	LG	BG	SLC	BT	Bd	Dd
4	E 1072	Scapula			48.1	49.5	40.0			
4	E 1101	Humerus						57.3		
4	E 1101	Radius		62.0						
4	E 1101	Radius							54.0	
4	E 1036	Tibia							51.8	37.9
4	E 1036	Metatarsal							47.9	
4	E 1072	Metatarsal							50.5	
3	A 2017	1st Phalanx	63.3	23.2						
4	A 2011	1st Phalanx	64.5	24.0						

Roe deer (*Capreolus capreolus* L.)

Period	Context	Element	BT	Bd
4	D 525	Metatarsal	24.8	25.0

Wild boar (*Sus scrofa* L.)

Period	Context	Element	GL	GLl	GLm	Bp	Dl	Bd	Dd
3	B 246	Radius				44.6			
3	C 4217	Metacarpal3				24.2			
3	C 5306	Tibia						37.5	34.4
4	A 2215	Astragalus		57.0	50.5		30.0		
2	D 676	Calcaneus	98.3						
3	C 4103	Calcaneus	105.0						
3	E 1189	Calcaneus	105.8						

Hare (*Lepus europaeus* L.)

Period	Context	Element	GL	GLP	Bp	LG	BG	Bd
3	C 151	Scapula		12.4		10.4	7.8	
3	C 5305	Humerus						13.2
3	P 5051	Humerus			18.4			
4	E 1078	Humerus						13.6
2	B 338	Radius			9.4			
3	P 5050	Radius			9.3			
4	D 571	Radius			10.4			
4	S/5263	Radius			10.5			
3	A 2206	Metacarpal3			4.3			
3	R 5218	Tibia						10.1
3	C 5306	Metatarsal2	60.5					
3	D 701	Metatarsal2	57.5					
3	P 5051	Calcaneus	39.4					
3	A 2017	1st Phalanx	30.5		8.4			
4	A 2109	1st Phalanx	26.0		6.2			
4	A 2140	1st Phalanx	24.8		6.8			

11

THE SMALL MAMMALS

by

Simon A. Parfitt

Introduction

The excavations at Nicopolis have provided the first well-documented assemblage of small mammals from any multi-phased archaeological site in the Balkan Peninsula. The assemblage is particularly important because the small mammal bones were recovered from stratified and well-dated contexts which span the full period of occupation on the site, from the early second century AD down to and including the post-medieval period. As such, the assemblage provides a rare opportunity to examine changes in the small mammal fauna, particularly during the Roman, late Roman and early Byzantine periods.

For the purposes of this report, small mammals are defined as mammals with adult body weight ranging from between 2 grams (shrew, bat) up to the size of a hare (*c* 5 kilograms). Mammals in this size category comprise a taxonomically diverse and ecologically important group, which has been largely ignored by zooarchaeologists. There are several reasons why small mammals have not received the attention afforded to large mammal remains, the major one being the lack of fine-mesh sieving at most sites. This reflects, at least in part, the focus of zooarchaeological research, which has historically explored aspects of site economy and reconstructing hunting or husbandry practices. There is a wealth of information on archaeological large mammal data concerning these issues. In comparison, the small mammal record, particularly from the later historic periods, is sketchy to say the least. Notwithstanding, the value of small mammal remains has been amply described by among others; Brothwell and Jones (1978), Rackham (1982), Armitage (1985), West and Milne (1993) and Stahl (1996). These case studies show that archaeological small mammal data can provide interesting archaeological insights and an additional source of information which helps to answer questions about site environment, status and function. Moreover, the remains are important because they provide a valuable contribution to the biogeographical study of present-day distributions. In this respect, the house mouse and black rat bones from Nicopolis, which include the earliest record of black rat in the Balkan Peninsula, provide significant new information on the history of these economically important pest species.

This contribution describes the small mammal assemblage in detail and attempts to use the data to provide an environmental reconstruction of the site and its setting. This was possible because the sampling programme at Nicopolis was specifically designed to recover a range of biological data, including an unbiased sample of small mammals.

Methods

The small mammal bones and teeth were identified to the lowest taxon by direct comparison with the modern osteological collections at the Natural History Museum (London). To facilitate the analysis of the assemblage, the data were coded and entered into a computer database. A copy of this database is housed with the site archive at Nottingham University and a more detailed archive, which includes a list of measurements, is kept with the small mammal remains in the osteology collections of the Natural History Museum in London.

Assemblages of small mammal bones were recovered by sieving and by hand excavation from the following areas: A, B, C, D, E, F, K, M, P, R and S (Table 11.3). The limited sample size from individual areas has precluded any detailed intra-site analysis. Consequently, small mammal bones have been grouped simply into assemblages and ascribed to the appropriate period. The assemblages have been assigned to one of the following periods:

PERIOD	DATE (AD)	HISTORICAL PERIOD
1	*c* 100 – *c* 175	Early Roman
2	*c* 175 – *c* 250	Mid Roman
3	*c* 250 – *c* 450	late Roman
4	*c* 450 – *c* 600	early Byzantine
5	*c* 800 – *c* 1000	Slav
6	*c* 1750 – *c* 1850	post-medieval

Small mammal remains were occasionally recovered by manual excavation, but this produced a highly biased assemblage (see below). A special effort was made during the excavation to recover an unbiased assemblage of small bones and, to this end, soil samples (each usually 10 litres) were washed through a 1mm mesh and the resulting residues were sorted for small mammals and other classes of biological and artefactual remains. A summary of the bulk sample data is given in Table 11.1 and Appendix 11.1. The vast majority of the bones and teeth, particularly those of mice, voles and shrews, was recovered in this way.

The samples mostly have relatively low densities of small bone material and relatively few identifiable items. Of the 370 samples, representing approximately 3612 litres of sediment, just over one third contained identifiable small mammal remains. Chronologically, there is a significant variation in the distribution of small mammal remains. This is apparent both in the number of contexts producing identifiable remains and in the absolute number of bones per sample. Table 11.1 shows that the number of contexts with small mammals is highest in the early Byzantine and post-medieval periods where over 40% of the contexts sampled did contain small mammal remains. The proportion of contexts with small mammal remains is lower in the Roman periods with only a quarter of the samples producing small mammal remains. An additional indication of the low frequency of small mammal bones is provided by the number of bone fragments per litre of sediment (Table 11.1, bottom row). Both these

Table 11.1 Summary of sample data and small mammal bone density at Nicopolis. In addition to these samples, a further 120 samples were taken from 'unphased' contexts (total 1157 litres) of which 115 have volume data. A detailed list of samples by Area and Phase is given in Appendix 11.1. The 'unphased' material comes from contexts that cannot be accurately dated, those that span more than one phase of occupation. Contaminated contexts with a high level of residual or intrusive artefactual material are included in this group.

PHASE	**1**	**2**	**3**	**4**	**5**	**6**
DATE	**100–175**	**175–250**	**250–450**	**450–600**	**800–1000**	**1750–1850**
PERIOD	**Early Roman**	**Mid Roman**	**Late Roman**	**Early Byzantine**	**Slav**	**Post-Medieval**
Total number of samples	29	33	97	111	11	67
Number of samples with volume data	27	33	91	109	11	60
Total volume of sediment sieved (L.)	331	443	922.9	1050.5	57.25	433.9
Mean volume of sample (L.)	12.3	13.4	10.1	10.1	9.6	7.2
Percentage of samples producing small mammals	32	26	29	44	0	45
Total number of identifiable fragments [a]	337	24	77	116	0	105
Total number of taxa [b]	5	6	15 [b]	12	0	13
Number of bone fragments per Litre	0.11	0.05	0.07	0.10	0	0.19

[a] Total excludes hare, small mustelid, and domestic cat remains identified by Beech (see above, p 154).

[b] Small canid not included.

methods of estimating the concentration of bones through time show a broadly similar pattern of bone frequency for each of the periods.

Taphonomy

Preservation of the bones from all periods of the site was generally extremely good. The calcareous loess subsoil prevented much chemical corrosion and cushioned the bones from mechanical damage. There are a number of possible mechanisms for the accumulation, deposition and burial of small mammal bones in archaeological sites, the most important of which is predation by carnivorous mammals, birds of prey or owls (Andrews 1990). Bone surface modification provides one of the most direct indications of the taphonomic history of an assemblage. During the identification stage of the analysis, the bones were examined under a low-power binocular microscope to record details of surface alteration and condition (eg, signs of butchery, carnivore alteration, charring, and weathering) which would provide information on the mechanisms by which the bones accumulated. A number of the small mammal bones show evidence of digestion, including pitting and corrosion which suggest that these bones were transported to the site in the stomachs of birds of prey or mammalian predators. However, the low concentration of bones shows that birds of prey were not roosting in any numbers within the settlement. With the exception of hare, which were hunted and eaten, it is suggested that most of the bones are from natural (non-predator) deaths at the site.

Given that many of the small mammal species recorded in the subfossil assemblage are either accomplished burrowers or commonly live in burrows, the possibility of their being intrusive cannot be ruled out. A small number of ground squirrel bones were unusually fresh in appearance and these are assumed to be modern intrusive bones from animals buried in collapsed tunnels. Excluding these, the majority of the bones are very similar in colour and condition to the large mammal, bird and fish remains from the site. If the condition of the bones reflects their relative age, then the majority of the assemblage is probably ancient. Importantly, the most common rodent in the assemblage, the black rat, does not burrow, so their remains are likely to be broadly coeval with the deposits in which they were found. Additionally, small bones are highly susceptible to movement through soil profiles and there is

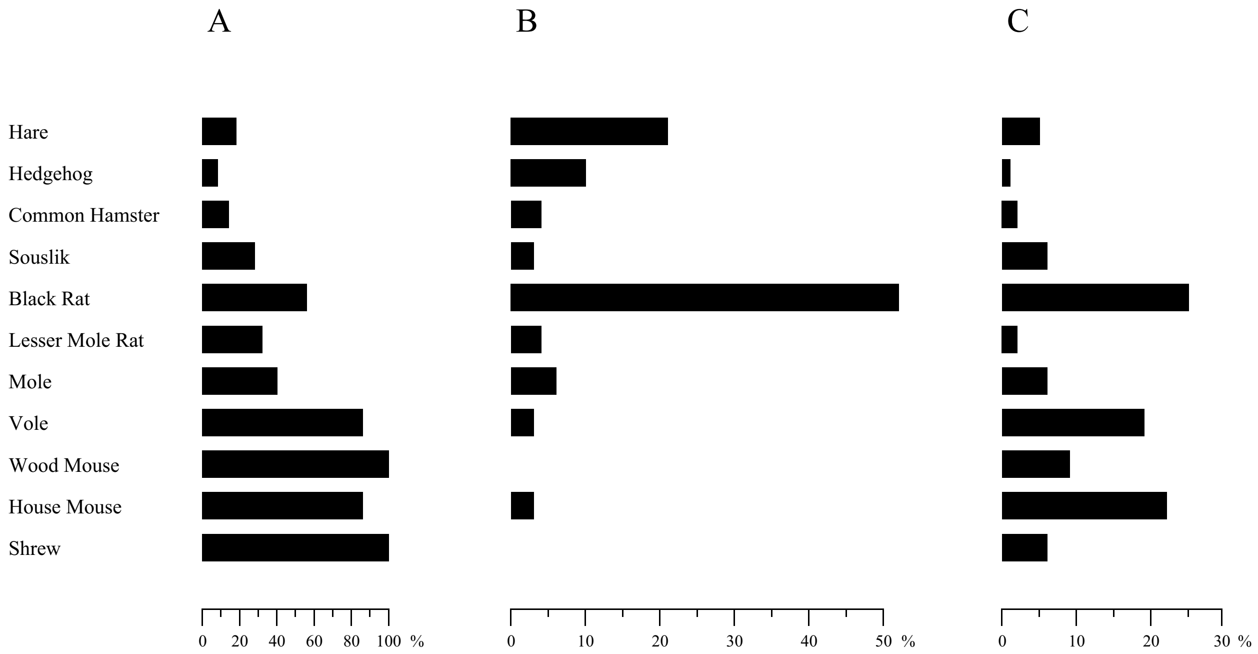


Fig 11.1 Comparison of small mammals recovered by sieving and manual excavation. (A) Percentage of bones recovered by sieving. (B) Faunal composition of excavated sample. (C) Faunal composition of sieved sample. The taxa are arranged in order of increasing body from large (hare, adult weight 2500–7000g, head-body length 480–700mm) to small (shrew, adult weight 3.5–6g, head-body length 50–82mm)

Table 11.2 Small mammal remains from Nicopolis ad Istrum. The frequency per taxon refers to the number of identifiable specimens (NISP) recovered by sieving and manual excavation. Numbers in parenthesis are hare, small mustelid and domestic cat remains recorded by Beech (this volume). Note these are not included in the totals.

PHASE	**1**	**2**	**3**	**4**	**6**	**Unphased**	**Total**
DATE	**100–175**	**175–250**	**250–450**	**450–600**	**1750–1850**		
PERIOD	**Early Roman**	**Mid Roman**	**Late Roman**	**Early Byzantine**	**Post-Medieval**		
Insectivores							
Eastern hedgehog, *Erinaceus concolor*	-	-	2	-	-	5	7
Bi-coloured white-toothed shrew, *Crocidura* cf. *leucodon*	-	-	-	-	2	-	2
Lesser white-toothed shrew, *Crocidura suaveolens*	-	-	-	1	1	-	2
Northern mole, *Talpa europaea*	-	-	4	5	-	6	15
Shrew, Soricidae gen. et sp. indet.	-	-	-	-	1	-	1
Bats							
Natterer's bat, *Myotis nattereri*	-	-	1	-	-	-	1
Lagomorphs							
Brown hare, *Lepus europaeus*	1 (2)	- (4)	12 (58)	12 (12)	3 (20)	4	32 (96)
Rodents							
European souslik, *Spermophilus citellus*	-	-	7	-	3	2	12
Common hamster, *Cricetus cricetus*	-	-	2	1	-	11	14
Romanian hamster, *Mesocricetus newtoni*	-	-	2	1	1	3	7
Water vole, *Arvicola terrestris*	-	-	-	-	1	-	1
Common and/or sibling vole, *Microtus arvalis /M. rossiaemeridionalis*	-	-	-	3	2	-	5
Guenther's vole, *Microtus* cf *guentheri*	-	-	2	-	-	1	3
Vole, *Microtus* sp(p).	4	1	-	9	5	1	20
Lesser mole rat, *Nannospalax leucodon*	-	-	1	2	1	5	9
Wood mouse and/or yellow-necked mouse, *Apodemus sylvaticus/ A. flavicollis*	1	2	1	5	3	-	12
Black rat, *Rattus rattus*	1	3	68	9	6	39	126
House mouse, *Mus musculus*	3	2	2	13	11	2	33
Small rodent, Rodentia gen. et sp. indet.	8	3	18	31	24	19	103
Carnivores							
Small canid, Canidae gen. et sp. indet.	-	-	1	-	-	-	1
Marten, *Martes* sp	-	-	1	-	-	-	1
Mustelid, Mustelidae gen. et sp. indet.	-	-	1 (5)	-	(1)	-	1 (6)
Carnivore, Carnivora gen. et sp. indet.	1	-	-	-	-	1	2
Cat (domestic), *Felis* sp.	-	33* (1)	- (17**)	- (6)	- 3	-	36 (24)
Indeterminate small mammal	26	18	94	94	57	48	337
Total	121	39	61	220	188	155	783 (126)

* Partial skeleton (NISP=33)
** Includes partial skeleton (NISP=7)

Table 11.3 Distribution of small mammals between excavation areas and phases (see Appendix 11.1 for a detailed list).

	A	B	C	D	E	F	K	M	P	R	S
Phases with vertebrate remains	**1, 2, 3*, 4, 6***	**1, 2, 3, 4**	**1, 2, 3, 6**	**1, 2, 3, 4, 6**	**3, 4, 6***	**3, 4, 6**	**3, 4, 5, 6**	**2, 3, 6**	**1, 2, 3, 4**	**3, 4, 6**	**3, 4**
Insectivores											
Erinaceus concolor Martin, eastern hedgehog	1	-	-	-	3	+	-	-	-	3	-
Crocidura cf. *leucodon* Hermann, bi-coloured white-toothed shrew	-	-	-	-	4, 6	-	-	-	-	-	-
Crocidura suaveolens (Pallas), lesser white-toothed shrew	-	-	-	4	-	-	-	-	-	-	-
Soricidae, shrew	-	-	-	-	-	6	-	-	-	-	-
Talpa europaea Linn., northern mole	4	-	3	-	4	+	+	-	-	+	-
Bats											
Myotis nattereri (Kuhl), Natterer's bat	-	3	-	-	-	-	-	-	-	-	-
Lagomorphs											
Lepus europaeus Pallas, brown hare	1, 3, 4	3	2, 3	1, 2, 3, 4, 6	3, 4	3, 4, 6	3, 6	3, 6	3	3	4
Rodents											
Spermophilus citellus (Linn.), European souslik	3	-	6	3, 6	6	-	-	-	3	-	3
Cricetus cricetus (Linn.), common hamster	-	-	3	4, 6	-	4	-	-	3	+	-
Mesocricetus newtoni (Nehring), Romanian hamster	-	-	-	-	4	+	-	-	3	6	-
Arvicola terrestris (Linn.), water vole	-	-	6	-	-	-	-	-	-	-	-
Microtus arvalis (Pallas) / *Microtus rossiaemeridionalis* Ognev, common / sibling vole	-	-	-	+	4	-	-	-	-	-	-
Microtus cf *guentheri* (Danford & Alston), Guenther's vole	-	-	3	-	-	-	-	-	-	-	-
Microtus sp(p), vole	4	1, 2	+	4, 6	4, 6	6	-	-	-	-	-
Nannospalax leucodon (Nordmann), lesser mole rat	6	3	+	-	4	+	-	+	-	-	-
Apodemus flavicollis (Melchior) / *Apodemus sylvaticus* (Linn.), yellow-necked / wood mouse	3	1, 2	-	4, 6	4, 6	6	-	-	-	-	-
Rattus rattus (Linn.), black rat	3, 4	1, 2	3	3, 4, 6	4	3, 6	3, 6	+	2, 3	3	3
Mus musculus Linn., house mouse	1, 3, 4	1, 2	-	3, 4, 6	4, 6	6	6	6	4	-	-
Carnivores											
Canidae, small canid	-	-	3	-	-	-	-	-	-	-	-
Martes sp., marten	-	-	-	-	-	-	-	-	3	-	-
Mustelidae, small mustelid	-	-	-	-	3	3	3	-	3	-	-
Felis sp., cat (domestic)	-	3	3	2, 4	3, 4	-	-	-	-	-	-

+ denotes taxon recorded only from unphased context(s), * indicates Phase that has produced small mammal remains, but no large mammal remains.
Mark Beech data included in this table (cat, polecat (combined with mustelid), and hare)

a possibility that the bones have been reworked or carried down into the deposits by earthworm activity (Armour-Chelu and Andrews 1994). At Nicopolis, burrowing may have sorted the assemblage to some extent, but mixing is probably minimal due to the rubble make-up of most of the later levels, which would have impeded the downward migration of bones through the soil profile.

A further problem involved in the interpretation of this assemblage is that of sample bias introduced by the recovery of part of the assemblage by manual excavation. As Payne (1972, 1975) has shown, hand-collection results in the recovery of a very biased sample with a bias towards larger bodied animals and bone elements. The extent of this bias at Nicopolis was investigated by comparing the number of bones of each small mammal taxon recovered by sieving and by manual excavation. The results of this comparison are summarised in Figure 11.1, which shows: (A) the percentage of bones for each small mammal taxon recovered by sieving; and (B and C) the faunal composition of the small mammal taxa recovered by the two different collection procedures. This analysis reveals that the hand-retrieved assemblage and the sieved assemblage differ dramatically. This is particularly noticeable in the case of the smallest taxa; the hand-retrieved sample is virtually devoid of smaller bodied shrews and mice, and overall the sample is biased towards the larger-bodied small mammals.

Results

A total of 783 small mammal bones and teeth were recovered of which 302 (38.6 % of the assemblage) were identified to genus or species. The larger proportion of the specimens belongs to the two common pest species, black rat and house mouse, but overall 17 taxa were identified. Also, fragmentary remains of larger mammals, such as cat and fox, were amongst the remains submitted for identification and these are tabulated for completeness. The full species list, together with the number of identified specimens (NISP) within each taxon, is presented in Table 11.2 and a summary of the distribution of the taxa between the excavated areas is given in Table 11.3. The taxa are described in the following section in systematic order. Taxonomy used follows ‘The Atlas of European Mammals’ (Mitchell-Jones *et al* 1999).

INSECTIVORA

Eastern hedgehog (*Erinaceus concolor*)

The eastern hedgehog (*Erinaceus concolor*) is represented by a damaged skull and mandible from Area F context 3119. This context also yielded a scapula (distal epiphysis fusing) and tibia (proximal and distal epiphyses unfused), which are probably from the same sub-adult individual. Hedgehog remains were also recovered from two contexts dated to period 3 (E 1192, R 5218) and periods 1–3 (A 2175).

There are two species of *Erinaceus* in Europe, the eastern hedgehog, *E. concolor*, and the western hedgehog, *E. europaeus*. The two species are sympatric in a narrow (*c* 200 kilometre wide) zone from western Poland to the northern end of the Adriatic Sea (Mitchell-Jones *et al* 1999). The eastern and western hedgehogs are similar in general appearance and ecology, and although long considered as a single species, the eastern hedgehog is now regarded as a separate species from the western hedgehog (*E. europaeus*). European hedgehogs can be distinguished by their pelage and by osteological differences, in particular the morphology of the skull and mandible (Holz and Niethammer 1990a, b). The eastern hedgehog is widespread in Eastern Europe and exhibits a preference for areas with a mix of grassland, woodland and farmland. Like its close relative the western hedgehog, it is tolerant of human disturbance and it has adapted well to urban conditions where it thrives, feeding in gardens or scavenging in human garbage.

White-toothed shrews (Bi-coloured white-toothed shrew *Crocidura leucodon* and lesser white-toothed shrew *C. suaveolens*)

Shrews are poorly represented in the Nicopolis small mammal fauna and all of the identifiable remains

belong to the genus *Crocidura* (white-toothed shrews). Two species, the lesser white-toothed shrew (*C. suaveolens*) and the bi-coloured white-toothed shrew (*C. leucodon*), presently occur in northern Bulgaria; a third species, the greater white-toothed shrew (*C. russula*), is found in Western Europe. These taxa are readily distinguished on the basis of the morphology of the upper premolars and mandibular condyle (Genoud and Hutterer 1990, Krapp 1990, Niethammer and Krapp 1990b, Vlasák and Krapp 1990). The bi-coloured and greater white-toothed shrews do not differ appreciably in size, and measurements of the mandible show a broad overlap between these two species (Table 11.4). Osteological remains of the lesser white-toothed shrew are readily identified by their small size when compared with the other two species. Measurements of the Nicopolis mandibles given in Table 11.4 indicate that at least two species are present. The smaller size group is identical in size to the lesser white-toothed shrew and the larger size group represents one or both of the larger species, on biogeographical grounds, this is likely to be *C. leucodon* however.

Table 11.4 Comparison of measurements of the ascending ramus (in mm) of the Nicopolis white-toothed shrews with those of recent European species given by Niethammer and Krapp (1990).

		Height of mandibular ramus (mm)	
	n	Min. – Max.	Mean
Modern reference sample			
Lesser white-toothed shrew (*C. suaveolens*), Germany, Hungary & Italy	25	3.9 – 4.7	4.3
Greater white-toothed shrew (*C. russula*), Switzerland	26	4.7 – 5.2	4.9
Bi-coloured white-toothed shrew (*C. leucodon*), central Europe	19	4.6 – 5.2	4.9
Nicopolis			
Lesser white-toothed shrew (*C. suaveolens*)			
D 455.1, S 78 (Phase 4)		4.23	
E 1054.1, S 212 (Phase 6)		4.10	
Bi-coloured white-toothed shrew (*C.* cf. *leucodon*)			
E 1015.1, S 71 (Phase 6)		4.95	
E 1031.1, S 78-122 (Phase 4)		5.14	

S=sample number, n=number of specimens

The lesser white-toothed shrew is the most widespread of the shrews in Bulgaria today followed closely by the bi-coloured white-toothed shrew. These shrews are able to survive in a wide range of habitats and are particularly common in areas of dry vegetation with good ground cover. They are also found in cultivated land, gardens and farm buildings, and will even enter houses during the winter months.

Northern mole (*Talpa europaea*)

The northern or common mole (*T. europaea*) is represented by 15 bones in the assemblage. Today, the distribution of the northern mole embraces almost the whole of Europe with the exception of much of Scandinavia and large parts of the southern Mediterranean region where it is replaced by one of the southern species of blind mole (blind mole *T. caeca*, Iberian mole *T. occidentalis*, Roman mole *T. romana*, Balkan mole *T. stankovici*). In Bulgaria the northern mole is found throughout most of the country. In the extreme southeast it lives sympatrically with the smaller blind mole *T. caeca*. The small blind moles from southeastern Bulgaria and Turkey, were recently ascribed to *T. levantis* (Vohralík 1991), but according to Marshall-Jones *et al* (1990) this needs to be confirmed. Skeletal material of *Talpa europaea* and *T. caeca* can be differentiated on the basis of size and morphology of the cranium and pelvis. Measurements of the humeri of the blind and northern mole given by Niethammer (1990a and b) are summarised in the following table along with the corresponding measurements of the Nicopolis specimens.

*Table 11.5 Measurements of mole humeri (in mm) from Nicopolis compared with those of the blind mole (*T. caeca*) and northern mole (*T. europaea*).*

	Length			Distal width			Shaft width		
	n	Min. – Max.	Mean	n	Min. – Max.	Mean	n	Min. – Max.	Mean
Modern reference sample									
T. caeca (Yugoslavia, Male)	18	11.9 – 12.6	12.3				18	3.0 – 3.4	3.2
T. caeca (Yugoslavia, Female)	12	11.5 – 12.5	11.9				12	2.8 – 3.4	3.1
T. europaea (Rhineland)	14	14.5 – 16.6		14	7.8 – 9.2		14	3.8 – 4.6	
Nicopolis									
T. europaea (A 2110, Phase 4)		-			9.4			4.6	
T. europaea (C 4057, Phase 3)		-			7.7			4.1	
T. europaea (E 1036, Phase 4)		15.7			8.9			4.2	
T. europaea (F 3139)		16.9			9.7			4.6	

S=sample number, n=number of specimens

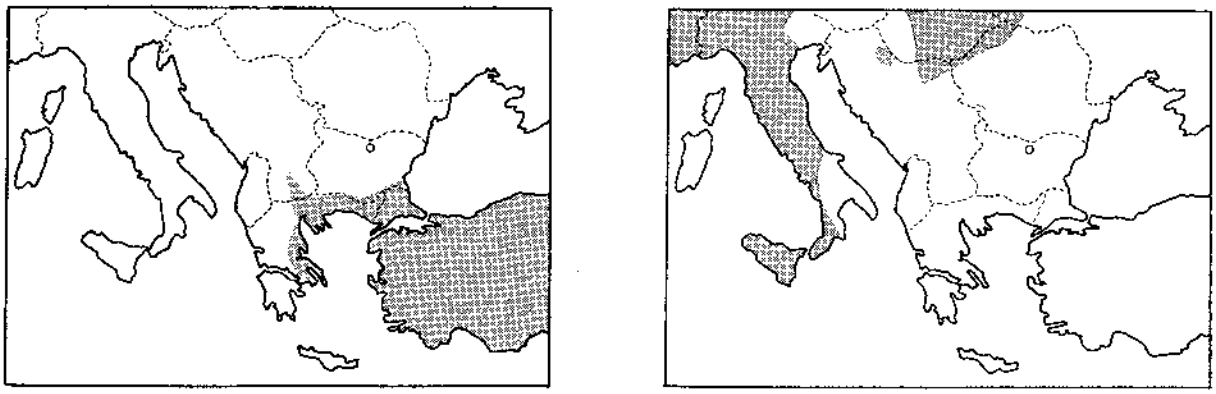
As can be seen from Table 11.5, the dimensions of the Nicopolis humeri are comparable in size to recent specimens of the northern mole and none are small enough to belong to the blind mole.

Moles are highly specialised burrowing animals, which are found in a wide variety of habitats including deciduous forest, meadows, cultivated fields and gardens. They prefer loose fertile soils and generally avoid rocky, sandy, acid or waterlogged soils.

CHIROPTERA

Natterer's bat (*Myotis nattereri*)

An unexpected find was a left mandibular ramus of Natterer's bat (*Myotis nattereri*) recovered from Area B (248, period 3). Although the ascending ramus of this specimen is missing, the last premolar and the molar tooth-row are present and the alveoli of the incisors, canine and premolars, are visible. The size of the mandible and the morphology of the remaining teeth match those of recent comparative specimens of Natterer's bat in the Natural History Museum (London). The discovery of Natterer's bat at Nicopolis is surprising as the site is approximately 500 kilometres to the south of the generally accepted present-day distributional area of the species in Eastern Europe. Figure 11.2b shows the location of Nicopolis in relation to the distribution of Natterer's bat given by van den Brink (1976). According to Bjärvall and Ullström (1986), Natterer's bat is widespread in temperate Europe but it is



A B

*Fig 11.2 The present-day distribution of (A) Guenther's vole (*Microtus guentheri*) after Neithammer and Krapp 1982, and (B) Natterer's bat (*Myotis nattereri*) after van den Brink 1976.* O = *Nicopolis ad Istrum*

absent or rare in much of south-eastern Europe, including the Balkan Peninsula (Ivanova 1995). Recently, however, trapping has shown that Natterer's bat occurs, albeit rarely, in a small number of scattered localities in Bulgaria (Horáček *et al* 1974) and Greece, and the 'The Atlas of European Mammals' (Mitchell-Jones *et al* 1999) records a scatter of records across the south-eastern peninsula of Europe. These records may represent vagrant individuals as breeding sites and large colonies have not as yet been recorded in Bulgaria. Given that bats are highly mobile creatures, the occurrence of individuals beyond the margins of their recorded range is not altogether surprising. Although the Nicopolis specimen may represent a chance find of a vagrant individual, it is also possible that Natterer's bat was formerly more widespread in the Balkans. If this were the case, then the Nicopolis find would imply that its range has suffered a contraction since Antiquity.

LAGOMORPHA

Brown hare (*Lepus europaeus*)

Brown hare (*Lepus europaeus*) is relatively well represented in the assemblage with 32 fragments, including two butchered bones. In addition, M. Beech (above, p. 185) identified 92 bones amongst the large mammal remains. The majority came from late Roman and early Byzantine deposits. Butchery marks were recorded on the proximal end of a tibia from a late Roman context and a pelvis fragment from an early Byzantine level. This indicates that the hare bones represent food refuse. Hares were hunted for sport in the Roman world and it is believed that the brown hare was introduced into Western Europe, perhaps from the East during the Roman period. Hares can be captured by trapping, hawking, or coursing with specially bred and trained dogs.

The preferred habitats of the brown hare are open areas such as rough pasture and arable land where a range of foodstuffs is available throughout the year. High population densities can be found in agricultural landscapes, specifically where there is a mixed patchwork of arable, pasture and woodland habitats.

RODENTIA

Rodents form the largest component of the small mammal fauna with 10 species. By far the most common are the black rat and house mouse which between them make up 46% of the identifiable rodent remains. The remaining taxa in order of decreasing abundance are common hamster (*Cricetus cricetus*), European souslik (*Spermophilus citellus*), wood or yellow-necked mouse (*Apodemus sylvaticus* or *A. flavicollis*), lesser mole rat (*Spalax leucodon*), Romanian hamster (*Mesocricetus newtoni*), common or sibling vole (*Microtus arvalis* or *M. rossiaemeridionalis*), Guenther's vole (*Microtus guentheri*) and water vole (*Arvicola terrestris*). Of the non-commensal forms, species which live in open grasslands and steppes, such as the common hamster, Romanian hamster, European souslik and lesser mole rat, are particularly common.

European souslik (*Spermophilus citellus*)

European souslik or ground squirrel is attested by 13 bones, a number of which are almost certainly recent as they are unstained and fresh. The souslik is an accomplished burrower, which lives in large colonies. It is probably the culprit responsible for the burrow features that were frequently observed during the excavation. The intrusive bones are a scapula, cranium and pelvis from Area A (2036) and a mandible from Area C (98). The remaining bones resemble the rest of the vertebrates in terms of condition and colour. If the condition of the bones is a reliable indication of its relative age, then these specimens are more likely to be contemporary with the deposits in which they were found. Of particular interest are two bones that show evidence of carnivore damage. A maxilla from Area D (542) with a partially digested dentition and a tibia from Area B (248) with puncture marks produced

by the teeth of a small mammalian carnivore are unlikely to be intrusive. The tibia is from a late Roman context and this find indicates that the European souslik was living at Nicopolis at this time.

Two species of ground squirrel are found in Europe; the European souslik (*Spermophilus citellus*) and the spotted souslik (*Spermophilus suslicus*). The spotted souslik is not found today in Bulgaria and the nearest known record of its existence comes from Romania. European sousliks are widespread in central and south-eastern Europe, including most of Bulgaria, where they inhabit dry grassland (both natural steppe and grazed grassland) with alkaline, well-drained, stone-free soils (Ružić 1978).

Common hamster (*Cricetus cricetus*)

The Common hamster (*Cricetus cricetus*) was identified from 14 bones. Unfortunately, most were from undated contexts. Dated bones consist of parts of a cranium and maxillary dentition from the early Byzantine period, and a humerus and tibia fragment from a late Roman level. A characteristic species of open grassland and cultivated steppe, it is confined to areas with loamy well-drained soil (Neithammer 1982a). In Bulgaria it is considered an endangered species with a patchy distribution along the Danubian lowlands (Dakov *et al* 1985, 141–2, Atanassov and Peschev 1983). Originally an eastern steppe species, the common hamster has dispersed far into Western Europe, its advance following agricultural clearances for cereal cultivation and the creation of 'culture-steppe'.

Romanian hamster (*Mesocricetus newtoni*)

Romanian hamster (*Mesocricetus newtoni*) is present in deposits dating to the late Roman, early Byzantine and post-medieval periods. Today, the Romanian hamster has a somewhat restricted distribution, being confined to parts of Moldavia and the Ukraine bordering the Black Sea, Romania and northern Bulgaria. The habitats in which the Romanian hamster is found are similar to those of the common hamster. Moreover, the Romanian hamster has a rather similar distribution in Bulgaria to the common hamster (Neithammer 1982b). Today it is sparsely distributed in northern Bulgaria from the foothills of the Balkan Mountains to the Danube, but appears to be absent from around the site of ancient Nicopolis.

Water vole (*Arvicola terrestris*)

Only one bone was identified as of water vole (*Arvicola terrestris*), a maxilla with an intact molar tooth-row from a post-medieval context. The water vole is widely distributed in Bulgaria where it is found mainly in grassy vegetation, often in damp habitats such as the banks of streams, slow-flowing rivers and lakes.

Common or sibling vole (*Microtus arvalis* or *M. rossiaemeridionalis*)

A small species of *Microtus*, either common (*Microtus arvalis*) or sibling vole (*M. rossiae-meridionalis* – note, *M. epiroticus* and *M. subarvalis* are synonyms) is represented by a partial skull and two right mandibles (Fig 11.3a). The first lower molars from these jaws are illustrated in Figure 11.4c and d from an early Byzantine level, and by a left mandible and right lower first molar (Fig 11.4e and f) from post-medieval contexts. The sibling vole *M. rossiaemeridionalis* was identified as a karyologically independent species amongst populations of the

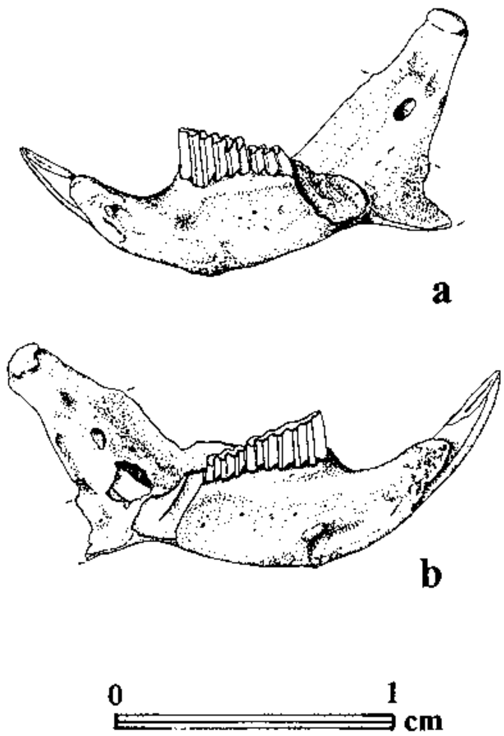


*Fig 11.3 (a) Right mandible (E 1087.1) of common or sibling vole (*M. arvalis / M. rossiaemeridionalis*) and (b) left mandible (C 4099.1) of Guenther's vole (*Microtus *cf.* M. guentheri*). Lingual views*

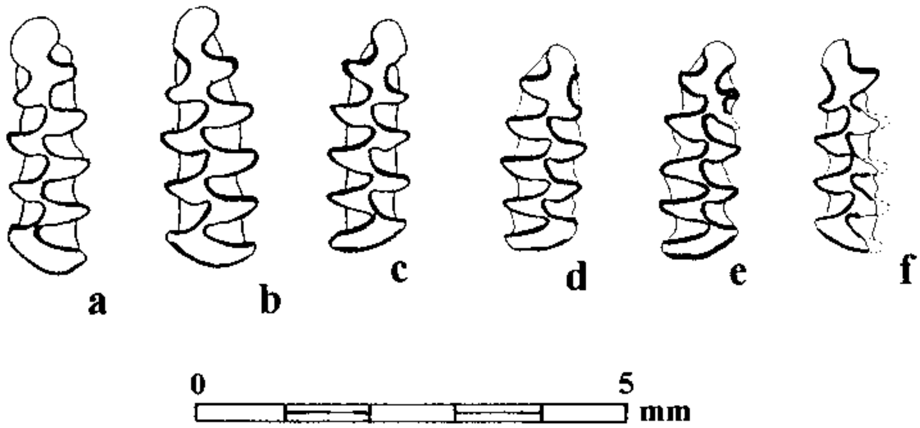


Fig 11.4 Morphological variation of lower first molars of Microtus *spp. from Nicopolis. (a–b)* Microtus *cf.* M. guentheri *(a. Left M_1 C 4099.1, b. Left M_1 C 125.2). (c–f)* Microtus arvalis/ rossiaemeridionalis *(c. Right M_1 1004.1, d. Right M_1 E1087.1, e. Right M_1 D 451.1, f. Left M_1 D 447.1). Occlusal views*

common vole in southern Europe – the boundary between the two species runs along the Danube valley (Mitchell-Jones *et al* 1999). There seems little possibility of identifying the Nicopolis material to species because the common and sibling vole appear to be indistinguishable osteologically. Ecologically, however, this distinction is not important because they occur in the same types of habitat throughout their range, with a strong preference for open grassland.

Guenther's vole (*Microtus cf M. guentheri*)

A left mandible with a complete tooth-row (Figs 11.3b and 11.4a) from a late Roman or early Byzantine level and a left and right mandible (first lower molar illustrated in Figure 11.4 b) from a late Roman context are almost certainly Guenther's vole, a small-medium sized vole that inhabits the eastern Mediterranean and which is now confined to the south easternmost corner of Bulgaria (Fig 11.2a). The appearance of this species in northern Bulgaria during the Roman period was unexpected and the find is of considerable biogeographical importance.

The distinction between subfossil remains of Guenther's vole and similar sized microtine rodents, such as the common vole (*Microtus arvalis*), sibling vole (*M. rossiaemeridionalis*) and the field vole (*M. agrestis*) is not easy because the lower first molars, which are generally the most diagnostic teeth in microtine rodents, are superficially very similar. The specimens of Guenther's vole from Nicopolis were identified by comparing the measurements and morphology of the teeth and mandibles with recent comparative specimens and published data relating to those species of the genus *Microtus* with a similar dental morphology (Neithammer 1982c, Neithammer and Krapp 1982a and b, Petrov and Ružć 1982). The measurements, morphology of the mandible and the dental pattern of the lower first molar of the Nicopolis specimens are illustrated in Figures 11.3, 11.4 and 11.5. In Figure 11.5 the dimensions of the Nicopolis specimens are shown along with those of species that have a similar tooth morphology to the Nicopolis specimens. The wide range of the dimensions as well as the relatively high coefficient of variation (CV=9.8) for the Nicopolis specimens indicate that more than one species is probably represented. Although the sample size is small, the dimensions of the Nicopolis lower first molars fall into two size groups: the dimensions of the smallest size group are within the observed range of recent common voles, whereas those of the larger size group fall outside or towards the upper end of size variation observed in the common and sibling voles. Although the molars of the larger size group are similar in size to the field vole, they differ from this species in the position of the nutrient foramen on the mandible and in the lack of asymmetry of the triangles of the lower molars (Nadachowski 1984). The occlusal surfaces of all of the *Microtus* specimens from Nicopolis are shown in Figure 11.4. The larger specimens, which are identified as Guenther's vole, differ in a number of morphological traits from the smaller specimens identified as either common or sibling voles.

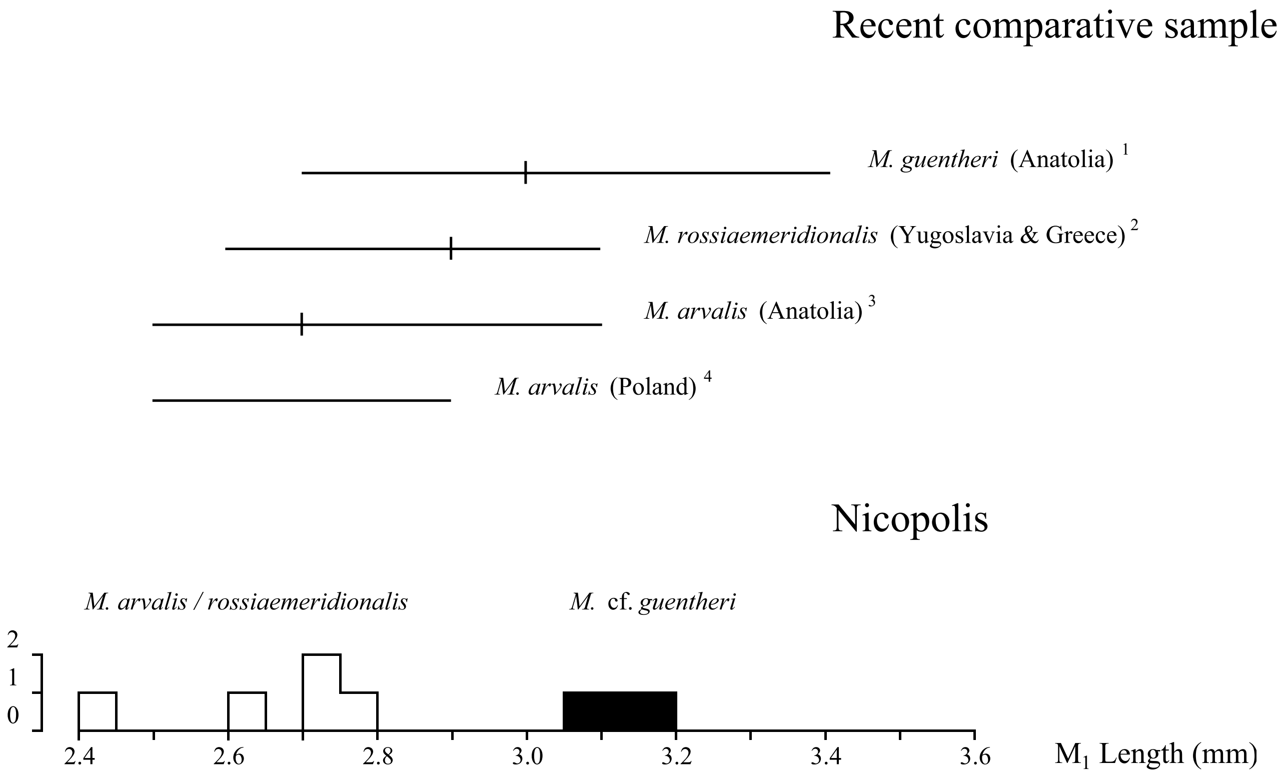


*Fig 11.5 Comparison of lower first molar length in recent populations of common vole (*Microtus arvalis*), Guenther's vole (*M. guentheri*) and sibling vole (*M. rossiaemeridionalis*) with specimens from Nicopolis. Horizontal bars show range and vertical bar the mean. Measurements of recent material are from: [1] Besenecker et al. 1972, [2] Petrov and Ružć, [3] Besenecker et al. 1972, [4] Nadachowski 1982*

The distribution of Guenther's vole is interesting as it is the most southerly species of vole in Europe and the only species of vole living in North Africa. Its main centre of distribution is in the Near East; in Europe it is restricted to the drier Mediterranean areas of eastern Greece bordering the Aegean Sea, Turkey, parts of the Macedonian Republic, and a small region in the extreme south-east of Bulgaria. According to Mitchell-Jones *et al* (1999), the most northerly extent of this species is south-eastern Yugoslavia (Latitude 42° N) and the nearest record of Guenther's vole to Nicopolis is from south-east Bulgaria, approximately 180 kilometres to the south. The occurrence of Guenther's vole in northern Bulgaria during the late Roman period is therefore of considerable interest. As yet there is insufficient evidence to decide whether this was a natural population (ie, a relict population of a formerly widespread distribution) that became extinct, or if the vole was accidentally transported to the site during the Roman period from the Mediterranean region. This latter explanation may seem improbable, but there are instances where voles have been transported in ships for considerable distances to isolated islands and established viable populations. For example, the common vole (*M. arvalis*) on the Orkney Islands, Scotland, has lived there for at least 4000 years, and was evidently transported to the islands from the European mainland, perhaps from Iberia (Corbet 1961).

Lesser mole rat (*Nannospalax leucodon*)

The lesser mole rat is present in late Roman, early Byzantine and post-medieval levels. Mole rats are specialised subterranean rodents with a highly modified anatomy and a distinctive skeleton adapted for tunnelling. Taxonomic agreement on the mole rats is far from complete. Of the three species of European mole rat recognised by Savić (1982), the lesser mole rat is the only species found in Bulgaria. The morphology of the well-preserved cranium from Area M (4846) is identical to that of *Nannospalax leucodon* described by Savić (1982). Mole rats are highly specialised for subterranean

life with greatly enlarged incisors, which they use to dig complicated burrow systems. When common, the mole rat is a serious agricultural pest feeding underground primarily on roots, tubers and bulbs. Their distribution is restricted to the drier steppic regions of south-eastern Europe where they are found in areas with dry fertile soils.

Yellow-necked or Wood mouse (*Apodemus flavicollis* or *A. sylvaticus*)

The species of murid that are presently living in Bulgaria are: *Micromys minutus* harvest mouse, *Apodemus agrarius* striped field mouse, *A. flavicollis* yellow-necked mouse, *A. mystacinus* rock mouse, *A. sylvaticus* wood mouse, *A. uralensis* pygmy field mouse, two species of rat and four species of 'house mouse' (Neithammer 1978a and b, Neithammer and Krapp 1987b, Mitchell-Jones *et al* 1999, Peshev 1987). The rock mouse (*Apodemus mystacinus*) and pygmy field mouse (*A. uralensis*) occur at the limit of their range and have a very restricted distribution in Bulgaria. More widespread are the striped field mouse (*A. agrarius*) wood mouse (*A. sylvaticus*) and the yellow-necked mouse (*A. flavicollis*), which are ubiquitous and occur throughout Bulgaria. Comparisons of the Nicopolis specimens with reference material showed that they belong to *Mus* and *Rattus* (described in detail below) and a species of *Apodemus*, either the wood mouse or yellow-necked mouse. The other species of *Apodemus* and *Micromys minutus* were excluded on the basis of size and/or morphological differences. Distinguishing between osteological remains of wood and yellow-necked mouse is problematic. Other than differences in size, there are no reliable morphological characters of the dentition which differentiate between the two species. Although the two species differ in size, skeletal dimensions show varying degrees of overlap. Without large samples, size alone does not provide a reliable basis for identification (Pradel 1989). Measurements of the Nicopolis dentitions fall within the range of the wood mouse, and within the zone of overlap between this species and the larger yellow-necked mouse.

Wood mice are found in a wide range of habitats from open country to woodland edge, hedgerows, scrub and gardens; the yellow-necked mouse is more closely associated with woodland, and is also found in farm buildings and houses during the winter.

Black rat (*Rattus rattus*)

Black rat (*Rattus rattus*) is the most common species in the small mammal assemblage represented by 126 identifiable fragments. These remains were distinguished from those of the brown rat (*R. norvegicus*) using morphological characters of the dentition and skeleton described by Armitage *et al* (1984) and Wolff *et al* (1980). In addition, these two taxa may be distinguished by size, as the brown rat is larger than the black rat. A comparison of the dimensions of the humerus, femur, tibia, and lower tooth-row from Nicopolis (Figs 11.6A–C, 11.7) with those of black and brown rat shows that there are no very large specimens. The biometrical analysis thus concurs with the morphological analysis in showing that the only species present is the black rat. Today, the black rat is sympatric with the brown rat in Europe. The brown rat spread across Europe in the eighteenth century. It is now by far the most common of the two having out competed the black rat over much of its former range. It is somewhat surprising therefore that brown rat is not present in the post-medieval deposits at the site.

It would appear that the black rat was resident soon after the town was founded in *c* 108. In this context it is interesting to note the find of a right humerus from Area B (258), dated to the first period of Roman occupation. The bone was found in the bottom fill of a bell-shaped pit that contained domestic rubbish dated to *c* 130–150. The pit was subsequently sealed by the paved roadway, constructed. *c* 150 (Poulter 1995, 67–71). This find is the earliest record of black rat in the Balkans.

The black rat is found in small numbers in all periods, apart from the late Roman period when there is a marked increase in the number of contexts producing rat bones (Fig 11.8, Table 11.6). The general implications of these variations are of some interest as they probably reflect changes in the intensity of human occupation and use of the site. The peak in rat abundance during the late Roman period coincides with archaeological evidence showing that occupation reached its zenith and the area in which the rats were found was a bustling suburb of the Roman city.

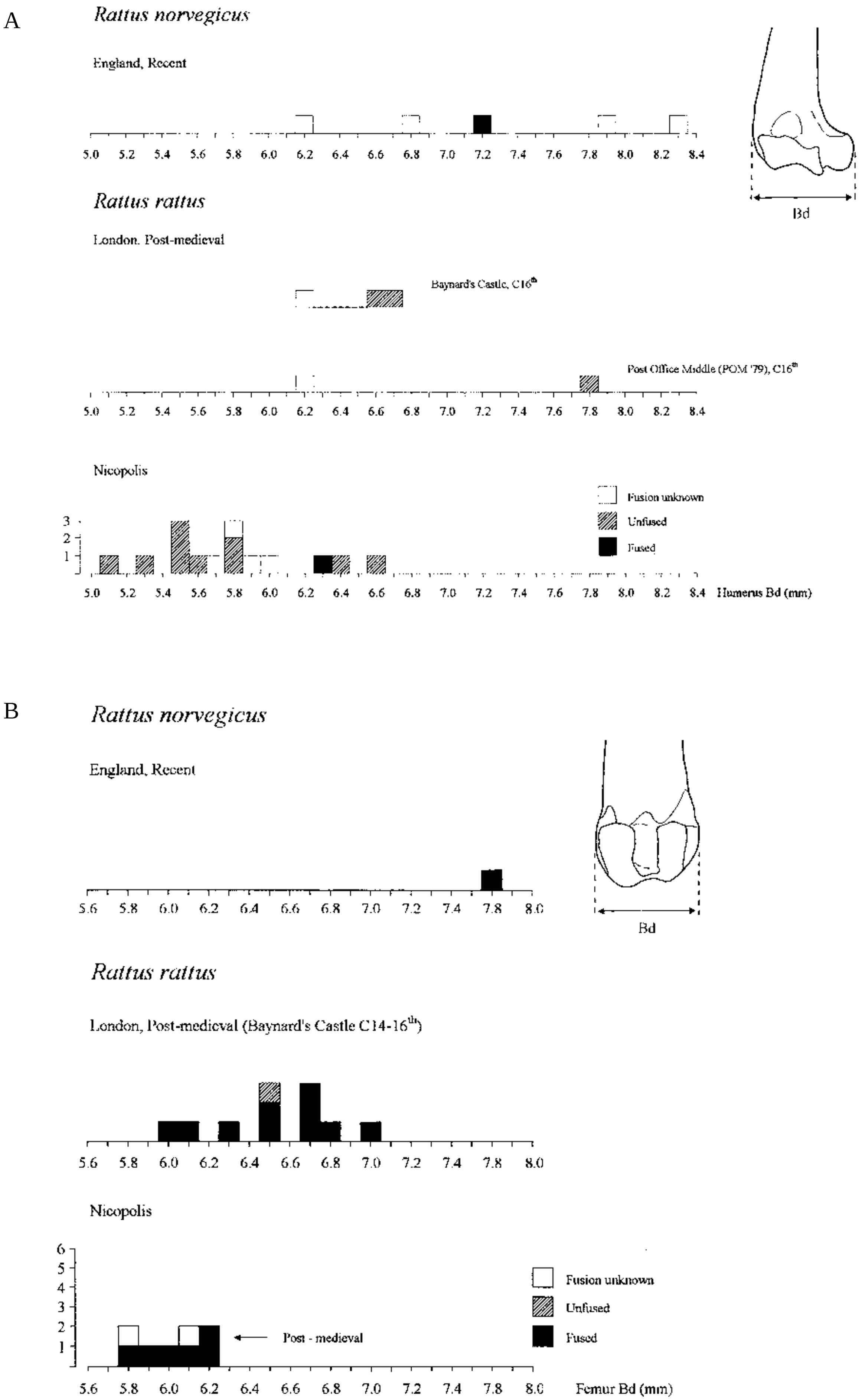


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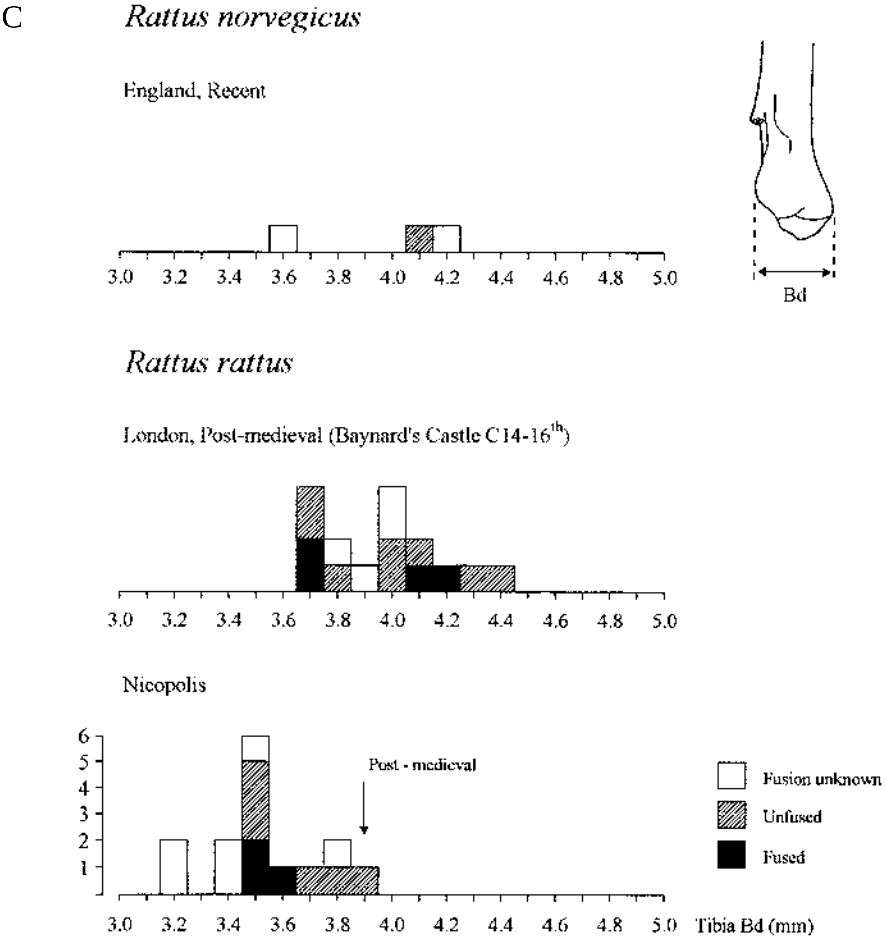
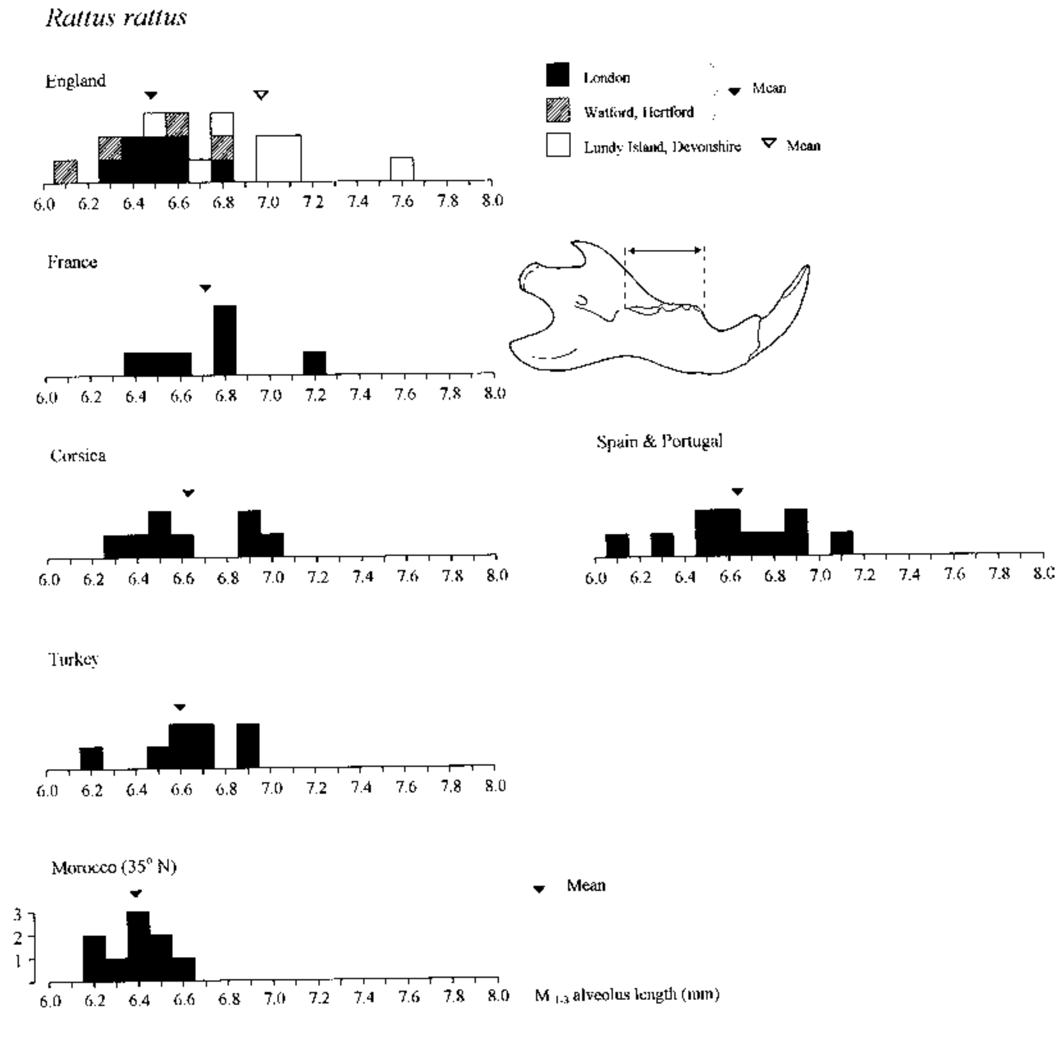


*Fig 11.6 Histograms showing the size distribution of black rat (*Rattus rattus*) post-crania from Nicopolis compared with post-medieval* R. rattus *from London and recent Brown rat (*R. norvegicus*) from England: (A) Distal breadth humerus. (B) Distal breadth femur. (C) Distal breadth tibia. Note fusion state, recorded for complete limb-bones, refers to the fusion state of the proximal end.*

Table 11.6 Temporal changes in the relative frequency (% of samples) of black rat and house mouse from Nicopolis.

PHASE	1	2	3	4	6
DATE	100–175	175–250	250–450	450–600	1750–1850
PERIOD	Early Roman	Mid Roman	Late Roman	Early Byzantine	Post-Medieval
Relative frequency of *Mus* (sieved contexts)					
Number of samples with identifiable small mammals	10	11	44	49	32
Number of samples with *Mus*	2	2	6	5	6
Relative frequency (% of sieved contexts with *Mus*)	20	18	14	10	19
Relative frequency of *Rattus* (sieved contexts)					
Number of samples with identifiable small mammals	10	11	44	49	32
Number of samples with *Rattus*	0	0	11	2	2
Relative frequency (% of sieved contexts with *Rattus*)	0	0	25	4	6
Relative frequency of *Rattus* (combined hand-retrieved and sieved contexts)					
Number of contexts and samples	15	14	88	67	41
Number of contexts and samples with *Rattus*	1	2	35	7	5
Relative frequency (% of contexts with *Rattus*)	6.7	14	40	10	12



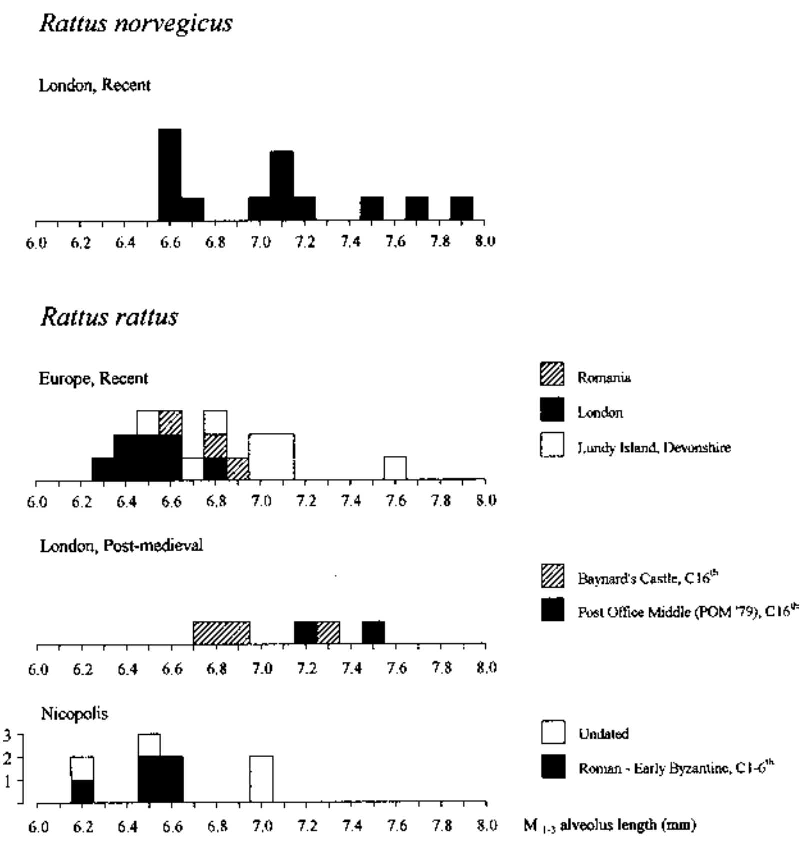


Fig 11.7 Histograms comparing lower tooth-row length (measured at the alveolus) of recent Rattus rattus *with those from Nicopolis and post-medieval sites in London, England. Histograms of recent* R. rattus *measurements are arranged in a latitudinal sequence. The samples from England are: wild-living populations from Lundy Island in the Bristol Channel, rats caught in dockside buildings and moored ships, and an urban population from Watford.*

The Nicopolis rat remains together with those found recently at Dichin (see above, p. 14) and at the villa site of Bela Voda, Pernik (Iliev *et al* 1992) are significant because they provide further evidence that black rats were widespread in the Roman world (Fig 11.10). Later finds from the early Byzantine occupation indicate continuity of rat populations in this part of the world at a time when black rats probably became extinct across much of Western Europe. This range contraction was coincident with the decline of urban centres and trade routes linking north-western Europe with the Mediterranean (O'Connor 1991). The evidence from Nicopolis and Dichin shows that rats continued to flourish in the post-Roman urban centres in the East (Fig 11.10, see also Vigne and Marinval-Vigne 1985). After a considerable hiatus in the use of the site following its abandonment *c* 600, rats reappear during the post-medieval occupation. Archaeological records of the black and brown rat are described amongst others by Armitage 1993, 1994, Audoin-Rouzeau and Vigne 1994, Ervynk 2002, Rackham 1979, Reumer 1986, Rougin 1991, Vigne *et al* 1994, Vigne and Fermolant 1991.

Age at death

As regards age composition, most of the complete long-bones were evaluated as sub-adult from epiphysial evidence (Table 11.7). As an alternative check, aging was attempted using the dental wear stages defined and illustrated by Armitage (Armitage in Morales and Rodríguez 1997). Unfortunately only 5 individuals could be aged using this method; 1 subadult, 2 young adults, 2 adults.

Biometry

The choice of measurements is largely determined by the degree of completeness of the Nicopolis specimens. Comparisons are restricted to articular measure-

Table 11.7 Epiphysial fusion of limb-bones of Rattus rattus from Nicopolis

	Fusion state	
	Unfused	Fused
Proximal humerus	11	1
Distal humerus	0	16
Proximal femur	0	15
Distal femur	5	8
Proximal tibia	6	(2*) 1
Distal tibia	0	15

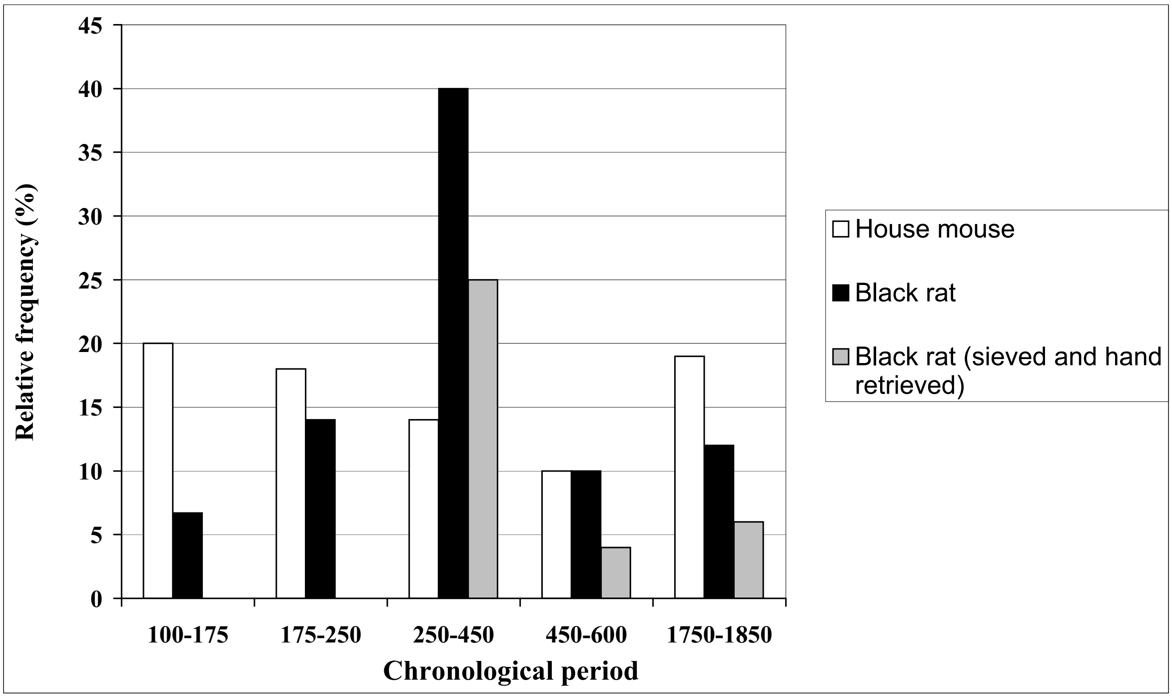


Fig 11.8 Temporal changes in the frequency of black rat (black = sieved and hand-retrieved sample, grey = sieved sample) and house mouse (white) at Nicopolis. Frequency is defined as the percentage of samples that yielded a given taxon, divided by the number of samples analysed for a given period

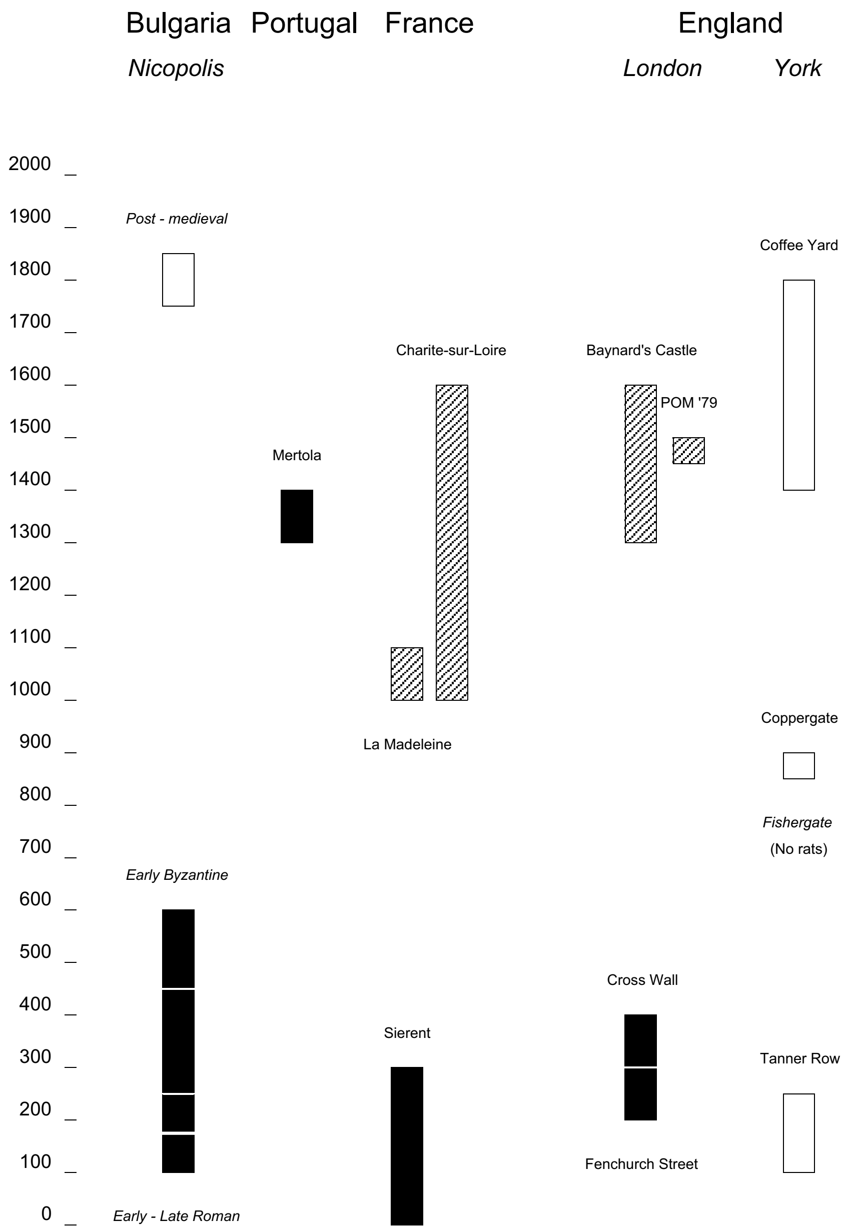


Fig 11.9 Summary of size change in archaeological black rats. Black bars indicate relatively small size, cross-hatched bars indicate large size. Data are not available for the York sample and the post-medieval remains from Nicopolis are too sparse for analysis. Note the apparent absence of black rat during the 7–10th centuries

ments (distal humerus, distal femur, distal tibia) and length of the lower tooth-row. The fusion state of the limb-bones was recorded as a check on age-related size change. However, none of the bones with one unfused epiphysis were appreciably smaller than those with fully fused epiphyses. Comparative published measurements, particularly post-cranial ones, are sparse, and the ones presented here were taken on modern skeletal material housed in the Natural History Museum, London. Roman and post-medieval black rat samples from sites in London were also measured (Armitage *et al* 1984, Armitage and West 1984). Figures 11.6 and 11.7 show that the Nicopolis rats are relatively small and similar in size to those from modern-day Romania and Roman sites in Western Europe (Parfitt unpublished data and measurements published by Audoin-Rouzeau 1986, Lüttschwager 1968, Vigne *et al* 1993, Vigne *et al* 1989, Vigne *et al* 1994).

An interesting phenomenon first discussed in detail by Armitage (1994) is the extremely large size of the black rat bones from post-medieval London and France, thus implying that a substantial size

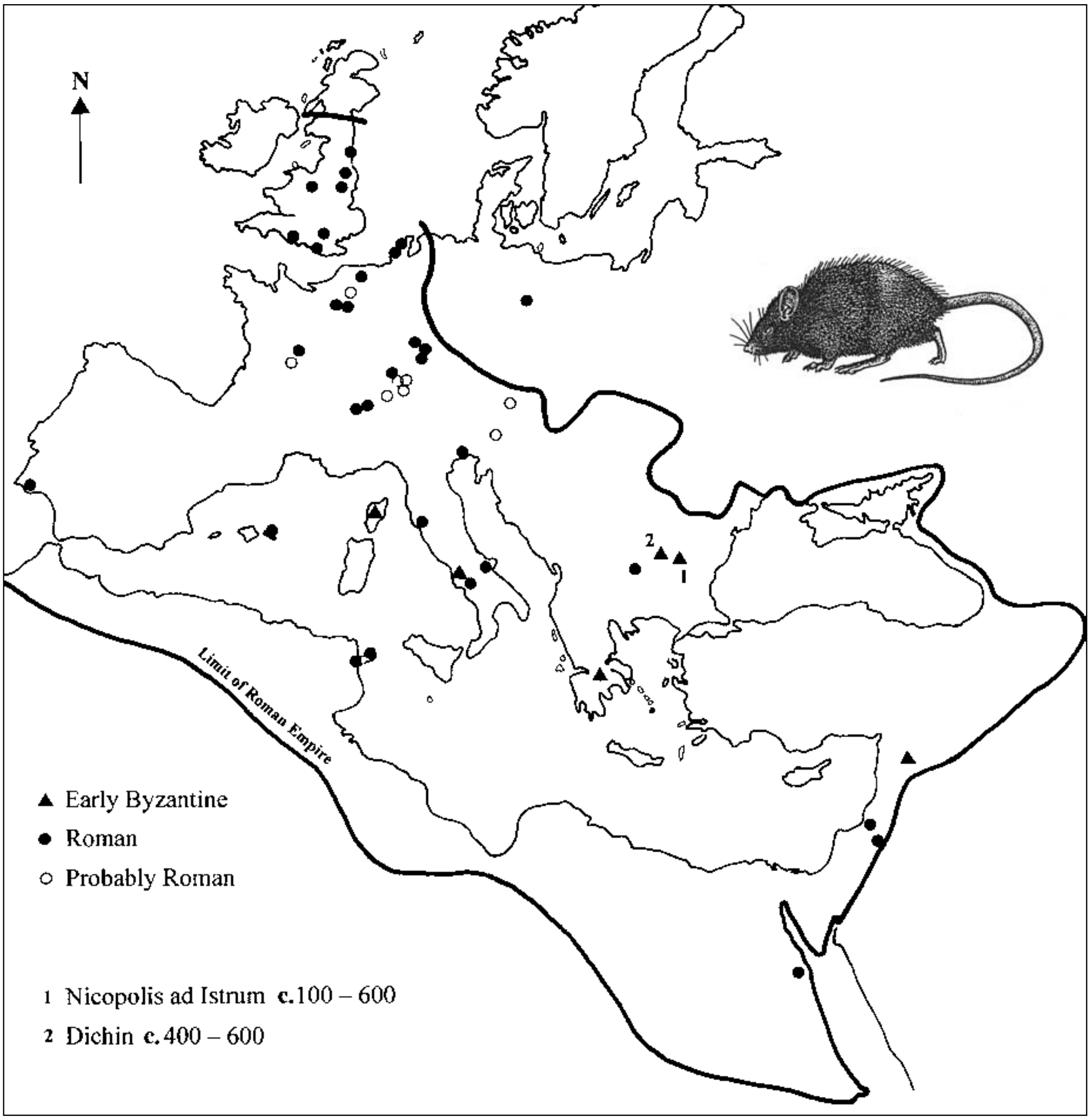


Fig 11.10 Geographical distribution of Roman and Byzantine black rat remains. Drawing of rat after P. Twisk from Mitchell-Jones et al. 1999. Compiled from Armitage et al. 1984, Audoin-Rouzeau & Vigne 1994, Ervynck 2002, Teichert 1985, Parfitt unpublished

increase occurred in some populations of European black rat between the Roman and post-medieval periods. Populations of large black rats appear to be restricted to north-western Europe, although a smaller size increase has also been observed in rats from some Mediterranean Islands. Armitage (1994) suggests that large body size in these post-medieval black rats was a response to decreased ambient temperature during the 'Little Ice Age'. The small size of the Roman rats (warm climate) taken in concert with the large size of northern European post-medieval rats ('Little Ice Age') would appear to support Bergmann's Rule (ie, size reduction of a species occurs in warmer climates, or conversely that size increases during a cold climate). This effect may be reflected in the slight increase in lower tooth-row alveolar length in modern black rats observed in a transect from North Africa to northern-central France and Lundy Island, in the Bristol Channel, England (Fig 11.7). The Lundy sample is particularly interesting in this respect because they are from a population of wild-living rats exposed to the full vagaries of the north Atlantic climate (Smith *et al* 1993). This decline in body size today

would support the suggestion that the large-bodied post-medieval rats lived in a much colder climate than those living in the same region today. However, there are arguments against cold stress having a strong selective force on rat body size in northern climes. Notably, black rats in cold climates circumvent periods of temperature stress by living in buildings. This behavioural response to the cold thus protects them from the physiological stress of cold ambient temperatures. Other factors may also have an influence on body size in rats, for example founder effect and genetic drift, and character displacement in association with strong competition from other small mammals. Food availability will also have an effect on body size; small body size may be a selective advantage when food is scarce and conversely it may be possible to sustain large body size when food is plentiful. One of these factors, or a combination of several factors, may explain the anomalously small size of the black rats from London, which is similar in size to the Moroccan population. The London rats were trapped in warehouses and ships docked in the Port of London. They almost certainly derive from newly-arrived populations with an origin in the tropics. This brief discussion illustrates some of the complexities involved in the interpretation of body size in sub-fossil rats. It is hoped that the collection and analysis of further archaeological samples will help to resolve this problem, and shed further light on the origin and spread of this economically important rodent.

House mouse (*Mus musculus* spp.)

The next most abundant rodent after the black rat is the house mouse (*Mus musculus*) with 33 fragments. This species occurs in approximately 14% of the sieved samples, which yielded identifiable small mammals. Unlike the black rat, the house mouse is more evenly represented through each period of occupation (Fig 11.8, Table 11.6). This sample, although small, is an important contribution to our knowledge of the distribution of the house mouse in the Roman world and it adds to the growing body of data relating to the history of the house mouse (Auffray *et al* 1990, Auffray and Britton-Davidian 1992, Brothwell, 1981, Carrascosa and López-Martinez 1988, Cucchi *et al* 2002).

The taxonomy of the genus *Mus* is complicated. Until recently, only one highly polymorphic species of *Mus* (ie, *Mus musculus*) was recognised in Europe. However, work by Orsini among others (Marshall 1981, Orsini *et al* 1982) has shown that there are several chromosome races and currently five taxa of the genus *Mus* are recognised in Western Europe and North Africa (Berry 1981, Bonhomme 1986, Corbet 1990, Marshall, 1981, 1986, Orsini *et al* 1982). Four of these come into contact in a limited region close to the Black Sea, an area including Bulgaria (Orsini *et al* 1982, Mitchell-Jones *et al* 1999). *Mus spretus* (Lataste's or Algerian mouse) of the western Mediterranean rim is the only species not found in Bulgaria. It was probably introduced unintentionally into southern Iberia from North Africa at least as early as the Bronze Age (Muñiz *et al* 1995). Of the Bulgarian species, two are wild-ranging and live independently of man: *Mus macedonicus*, the Balkan short-tailed mouse; and *Mus spicilegus* the steppe or mound-builder mouse. The other species, the house mouse *Mus musculus*, is essentially commensal living in close contact with human settlements. Two subspecies of the house mouse have been identified: *Mus musculus musculus* (eastern house mouse) present in northern and central Europe, and *Mus musculus domesticus* (western house mouse) living in western Europe and the circum-Mediterranean area. The boundary between *Mus m. musculus* and *Mus m. domesticus* runs right across Bulgaria with *Mus m. musculus* in the northern and central part and *Mus m. domesticus* in the south; there is a narrow hybrid zone where the two populations interbreed (Orsini *et al* 1982). The distribution of *Mus m. domesticus* is matched by the wide-ranging *Mus macedonicus*, which is restricted to the south of the country influenced by the Mediterranean climate – in the north, the distribution of *Mus m. musculus* is congruent with that of the wild-living *Mus spicilegus*, which is a characteristic species of natural steppe and cereal crops in this region.

Archaeozoological and genetic data has been used successfully to record the dispersal of *Mus* from its presumed homeland in Southeast Asia into the Near East, Europe and its near global dispersal during the last few centuries (Auffray et al 1990, Auffray and Britton-Davidian 1992, Brothwell 1981, Thaler 1986). House mouse, *Mus musculus*, first appears in the Middle East where the earliest known population, in Israel, dates from the end of the last glacial period ~12 000 years ago, when the first permanent

settlements were built (Auffray *et al* 1988). From there, invasion of the Mediterranean and Western Europe from the Middle East proceeded rapidly. According to Auffray *et al* (1990) the house mouse spread into this region through two separate routes of colonisation. The north-eastern population, *Mus m. musculus* followed the migration of agricultural peoples from Asia during the Neolithic. Later sea-migration and trade brought the western and southern sub-species, *Mus m. domesticus*, across the Mediterranean during the Bronze Age. From the Mediterranean littoral it spread inland, and into north-western Europe along trade routes skirting the Atlantic seaboard.

Osteological and morphological differences between these small mice have been studied in a number of populations (Auffray *et al* 1988, Cucchi *et al* 2002, Gerasimov *et al* 1990, Kraft 1984/85, Lyalyukhina *et al* 1991, Orsini *et al* 1982, Thaler 1986). This work has revealed that there is a clear distinction between wild-living and commensal house mice. However, the two subspecies of *Mus musculus* are not always easy to identify because of the high degree of morphological variability and morphometric overlap between populations of this complex.

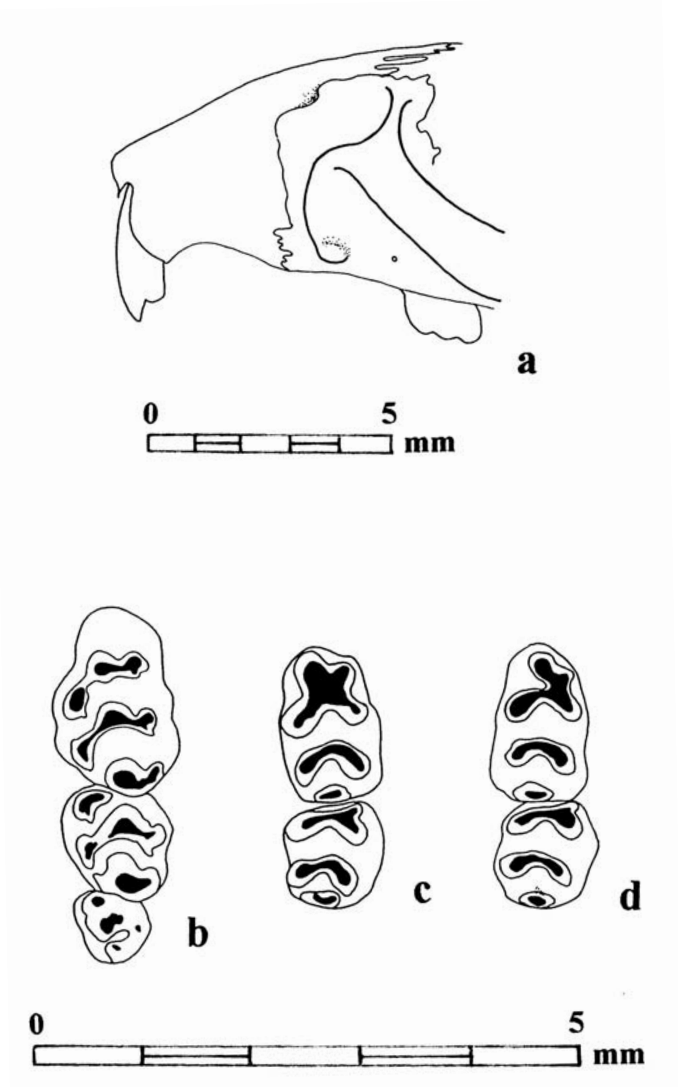


*Fig 11.11 House mouse (*Mus musculus*) from Nicopolis. (a) skull fragment (A 2281.1) lateral view. Note well-marked notch in the upper incisor, which is characteristic of* Mus musculus. *(b) Right maxillary teeth (F 3191.2), occlusal view. (c) Left lower first and second molar (F 3191.1), occlusal view. (d) Left lower first and second molar (E.1088.1), occlusal view*

All the *Mus* cranial and dental remains (Fig 11.11a–d) from Nicopolis represent *Mus musculus*, the house mouse, based on the characters described by Orsini *et al* (1982) and Kraft (1984/5). The subspecific determination of the Nicopolis finds is more problematical. Kraft (1984/5), in his osteological study of the Bavarian house mouse has identified morphological features of the dentition and cranium, which allow the two subspecies to be distinguished. However, there is a great deal of morphological overlap in these features, and the morphology of the hybrid forms has not been described. Kraft has noted differences in outline of the first lower molar; in *Mus m. domesticus* this is triangular in occlusal outline with a pointed anterior end – the shape of the anterior end is due to the reduction of one of the small cuspids at the front of the tooth. In comparison to this trilobed anterior cusp arrangement, the first lower molar *Mus m. musculus* has a tetralobed anterior cusp pattern and thus a more rectangular occlusal outline. Of the ten first lower molars from Nicopolis, seven most closely resemble *Mus m. musculus* (Fig 11.11d), and the others have a pattern that approaches that of *Mus m. domesticus* (Fig 11.11c). A second diagnostic character described by Kraft is the shape of the anterior border of the zygomatic plate. The straight and vertical margins of the zygomatic plate in the four crania from Nicopolis (Fig 11.11a) resemble *Mus m. musculus* more closely than *Mus m. domesticus* in which the plate has a distinctly arched border. In summary, the Nicopolis material suggests that the northern subspecies of house mouse (*Mus m. musculus*) lived within the settlement. There is also a possibility that some of the remains represent hybrid individuals or less likely *Mus m. domesticus*. The implication

of this being that the distribution of the house mouse subspecies in this part of Bulgaria has not changed since the Roman period.

The house mouse is an adaptable and highly opportunistic rodent, which is essentially commensal and normally associated with human habitations, food-stores and farm buildings, but also ventures into agricultural land in surrounding countryside. As noted previously, and in marked contrast with the black rat, the abundance of house mouse at Nicopolis does not fluctuate between periods of occupation. This may be because it is less-dependent on humans for its food and shelter, and therefore it was not affected in the same way by changes in the density of human occupation.

CARNIVORA

Small carnivores are not particularly common in the assemblage. Taxa identified include a cat, an indeterminate small mustelid, marten and a small canid. Marten, represented by an ulna fragment, came from a late Roman context in Area P (5022). Both pine marten (*Martes martes*) and beech marten (*M. foina*) have a widespread distribution in Bulgaria at the present time. Both are forest-dwelling carnivores; the pine marten is mainly found in coniferous and mixed forest, while the beech marten is less dependent on woodland and is often found in towns or nesting within buildings.

A small canid (probably fox *Vulpes vulpes*) is represented by part of a fourth metatarsal, which has been chopped and cut across the mid-part, presumably the result of skinning.

Cat is represented by associated bones of a young individual (the epiphyses of the bones were unfused) from Area E (1036). Interestingly, Beech (above, p. 183) records a second partial skeleton (E 1110). These are the only instances of skeletons at the site and suggest that cats were purposefully buried rather than thrown out with the rubbish.

Discussion

The most common elements of the small mammal assemblage were, not surprisingly, commensal rodents (black rat and house mouse) associated with human habitation and urban sites. In this respect the Nicopolis assemblage is typical of almost all European urban small mammal assemblages (Armitage 1985, Rackham 1982). The establishment and development of the settlement at Nicopolis entailed the creation of new and diverse habitats such as gardens, storerooms, houses and garbage heaps. The combination of warm buildings, stored products and waste heaps would have attracted wild-living and non-native pest species such as black rat and house mouse. These novel habitats would have favoured species that are pre-adapted to urban situations either because they are tolerant of human disturbance or because they tend to be attracted to human habitations for warmth, shelter or food. The small mammal remains collected from the excavation probably reflect this local small mammal community quite faithfully, but outside the settlement, clearance of woodland and changing patterns of agriculture would also have had an effect on the diversity and abundance of small mammals living in the hinterland.

It is instructive to compare the range of species found at the site with those living in the region today. Figure 11.12 tabulates the insectivore and rodent species currently living in northern Bulgaria together with a summary of their habitat preferences and an indication of their present-day abundance. Today, the mammal fauna of Bulgaria consists of 94 species, both large and small (Mitchell-Jones *et al* 1999, Peschev 1987). This high diversity of mammals is due to the varied landscape, geology, topography, soils, vegetation and hydrology of the region. Ancient Nicopolis, at the southern margin of the Danube basin, is situated near the boundary between deciduous woodland and steppe ecotypes. In this region today, the small mammal fauna is relatively diverse with 32 species (this total excludes bats and species larger than brown hare). This variety of small mammal species is not reflected to the same extent in the small mammal assemblage from Nicopolis. The total of 16 different insectivores, bat and rodents from the site might be taken to suggest that there existed a natural community, which was not so diverse in its composition as that which exists in the area at the present time. However, the

Fig 11.12 Distribution of insectivores and rodents currently living in Bulgaria north of the Stara Planina Mountains with respect to habitat. Also included is the extralimital vole Microtus guentheri *found at Nicopolis in the late Roman period. Size of the • is proportional to abundance of the species in each habitat. Bold text indicates that a species has a patchy distribution in the northern Bulgaria and that it is not recorded today in the immediate vicinity of the site. The number of 50 × 50 kilometer cells occupied by each species provides an indication of the present-day status and abundance of the taxa in Bulgaria (data derived from maps in Mitchell-Jones et al. 1999). Note, parentheses indicate taxonomic uncertainty, i.e. two or more closely-related species may be present which cannot be distinguished on the basis of the available material (eg* Apodemus sylvaticus *and/ or* Apodemus flavicollis*). Abundance records the percentage of 50 × 50 km cells in which each taxon has been recorded (data from Mitchell-Jones* et al *1999)*

	Abundance	Nicopolis Phase	Human habitation	Agricultural land	Pure steppe	Shrub, wooded steppe	Woodland	Wetlands
Rattus rattus, black rat	66	1, 2, 3, 4, 6	●					
Mus m. domesticus, western house mouse	16	(1, 2, 3, 4, 6)	●	●	•	•		
Mus m. musculus, eastern house mouse	24	(1, 2, 3, 4, 6)	●	●	•	•		
Spermophilus citellus, European souslik	82	3, 6		●	●			
(*Microtus arvalis*, common vole)	14	(4, 6)	•	●	●	●		
Microtus guentheri, Guenther's vole	8	3	•	●	●	•		
(*Microtus rossiaemeridionalis*, sibling vole)	24	(4, 6)		●	●	•		
***Mus spicilegus*, steppe mouse**	6			●	●	•		
Cricetus cricetus, common hamster	14	3, 4		●	●	●		
Mesocricetus newtoni, Romanian hamster	28	3, 4, 6		●	●	●		
Nannospalax leucodon, lesser mole rat	58	3, 4, 6		●	●	●		
Crocidura leucodon, bi-coloured white-toothed shrew	72	4, 6	•	●	●	●		
Lepus europaeus, brown hare	100	1, 2, 3, 4, 6		●	●	●	•	
Erinaceus concolor, eastern hedghog	70	3		●	●	●	•	
***Apodemus uralensis*, pygmy field mouse**	6			●	●	●	•	•
Micromys minutus, harvest mouse	32		•	●	●	●		●
Talpa europaea, common mole	80	3, 4		●	●	●	●	•
Apodemus agrarius, striped field mouse	48		•	●	●	●	•	•
Sorex araneus, common shrew	58			•	●	●	●	•
(*Apodemus sylvaticus*, wood mouse)	92	(1, 2, 3, 4, 6)		•	●	●	●	
***Sicista subtilis*, southern birch mouse**	2			•	●	●	●	
Crocidura suaveolens, lesser white-toothed shrew	84	4, 6	•	•	•	●		
***Sorex minutus*, pygmy shrew**	28			•	•	●	•	
(*Apodemus flavicollis*, yellow-necked mouse)	78	(1, 2, 3, 4, 6)	•			●	●	
Clethrionomys glareolus, bank vole	50					●	●	
***Microtus subterraneus*, common pine vole**	44			•	•	●	•	•
Dryomys nitedula, forest dormouse	62					●	●	
Glis glis, fat dormouse	66		•			•	●	
Muscardinus avellanarius, common dormouse	58						●	
Sciurus vulgaris, red squirrel	72						●	
Neomys anomalus, Miller's water shrew	66							●
***Neomys fodiens*, water shrew**	34							●
Arvicola terrestris, water vole	74	6						●

restricted range of species recovered from the excavation may be the result of other factors. These include, taphonomy, sample size and the way archaeological deposits were created which produced an assemblage that does not reflect the full range of species which actually existed in Antiquity. However, what is noticeable about the species list from the late Roman and early Byzantine periods is the lack of true woodland taxa as well as those associated with dense vegetation. The dominance amongst the non-commensal small mammals of those species closely associated with steppe, 'culture steppe' and other open environments over woodland/scrub species indicates that the area surrounding the city in the first period consisted of open grassland or arable whereas, in the early Byzantine period, the area within the fortifications did not contain overgrown areas of dense vegetation. The indications of a largely treeless landscape within and surrounding the settlement gained from the small mammal data are supported by evidence from molluscs (below, p. 296) and plant macrofossils (below, pp. 278–9).

While the majority of species found in the excavated sample still inhabit the region to this day, a small number of species are either very rare or are no longer found in the vicinity. These include the Romanian hamster and common hamster, which are now rare and endangered in northern Bulgaria. Of considerable interest is the discovery of Natterer's bat, which is a rare vagrant in Bulgaria, and Guenther's vole, which is today restricted only to the south-eastern part of the country. The reasons for this apparent change in the status of these species are unknown and it is hoped that further archaeological samples from Bulgaria will shed light on this interesting biogeographical problem.

Returning to the black rat and house mouse. Their abundance in the fauna indicates that these non-native pest species would have been a familiar sight in and around the buildings of ancient Nicopolis, their numbers fluctuating with the fortunes of the settlement. The dramatic increase in the number of black rat finds during the late Roman period may indicate a more intensive occupation of the site at this time, and then followed by a subsequent decline during the early Byzantine period (above, pp. 9–12). This interpretation of the changes in the settlement's prosperity correlates remarkably well with archaeological evidence that shows the most intensive use of the site was during the late Roman period. Interestingly, the house mouse does not show marked fluctuations in abundance, possibly because it is less-dependant upon human occupation for its survival.

Finally, the remains provide little evidence that the smaller wild animals were hunted for meat, their hides or their fur. The only indication to the contrary is represented by the discovery of two butchered hare bones. This does prove that this species at least was hunted but it would seem, in general, that small mammals were not valued as a source of food, nor were their skins used for the manufacture of clothing.

Acknowledgements

I would like to thank Juliet Clutton-Brock, Richard Sabin, Paula Jenkins, and Daphne Hills of the Mammal Section, Department of Zoology, The Natural History Museum, London, for access to their comparative collection. I am also grateful to Peter Andrews, Barbara West and John Stewart who commented on earlier drafts. Andrew Poulter and Mark Beech invited me to study the small mammal remains. I am grateful to them for providing references, encouragement, and advice and for their helpful criticism of the manuscript.

APPENDIX 11.1 SUMMARY OF ENVIRONMENTAL SAMPLES BY AREA AND PHASE

Area A

Phase	Number of samples	Volume/Litres	Number of samples without volume data
1	9	164.5	0
2	1	10	0
3	1	10	0
4	35	341.5	0
5	0	0	0
6	7	69	0
Undated	38	332	0
Total	91	927	0

Area B

Phase	Number of samples	Volume/Litres	Number of samples without volume data
1	18	136.5	1
2	19	167.9	0
3	37	260.4	2
4	2	8	1
5	0	0	0
6	1	9	0
Undated	12	31	1
Total	89	612.8	5

Area C

Phase	Number of samples	Volume/Litres	Number of samples without volume data
1	1	-	1
2	10	177	3
3	10	160.5	0
4	0	0	0
5	0	0	0
6	9	39.9	0
Undated	17	225	0
Total	47	602.4	4

Area D

Phase	Number of samples	Volume/Litres	Number of samples without volume data
1	0	0	0
2	3	88.5	0
3	32	260.5	0
4	22	144.5	0
5	0	0	0
6	32	163	7
Undated	7	56.5	1
Total	96	713	8

Area E

Phase	Number of samples	Volume/ Litres	Number of samples without volume data
1	1	30	0
2	0	0	0
3	7	161.5	0
4	44	424.5	1
5	0	0	0
6	6	48	0
Undated	14	99	0
Total	72	763	1

Area F

Phase	Number of samples	Volume/ Litres	Number of samples without volume data
1	0	0	0
2	0	0	0
3	5	20	4
4	8	132	0
5	11	57.25	0
6	11	100	0
Undated	17	364	0
Total	52	673.25	4

Area K

Phase	Number of samples	Volume/ Litres	Number of samples without volume data
1	0	0	0
2	0	0	0
3	5	50	0
4	0	0	0
5	0	0	0
6	1	5	0
Undated	0	0	0
Total	6	55	0

Area M

Phase	Number of samples	Volume/ Litres	Number of samples without volume data
1	0	0	0
2	2	-	2
3	2	-	2
4	1	26	0
5	0	0	0
6	3	108	0
Undated	9	226	0
Total	17	360	4

Area P

Phase	Number of samples	Volume/ Litres	Number of samples without volume data
1	0	0	0
2	6	-	6
3	3	120	0
4	3	66	0
5	0	0	0
6	1	22	0
Undated	6	244.5	0
Total	19	452.5	6

Area R

PHASE	1	2	3	4	6	Unphased	Total
DATE	100–175	175–250	250–450	450–600	1750–1850		
PERIOD	Early Roman	Mid Roman	Late Roman	Early Byzantine	Post-Medieval		
Hedgehog	-	-	1	-	-	-	1
mole	-	-	-	-	-	2	2
Hare	-	-	(1)	-	-	-	- (1)
Common hamster	-	-	-	-	-	1	1
Romanian hamster	-	-	-	-	1	-	1
Black rat	-	-	2	-	-	1	3
Total	-	-	3	-	1	4	8

Area S

PHASE	1	2	3	4	6	Unphased	Total
DATE	100–175	175–250	250–450	450–600	1750–1850		
PERIOD	Early Roman	Mid Roman	Late Roman	Early Byzantine	Post-Medieval		
Hare	-	-	-	(1)	-	-	- (1)
Souslik	-	-	1	-	-	-	1
Black rat	-	-	1	-	-	-	1
Total	-	-	2	-	-	-	2

No area information

PHASE	1	2	3	4	6	Unphased	Total
DATE	100–175	175–250	250–450	450–600	1750–1850		
PERIOD	Early Roman	Mid Roman	Late Roman	Early Byzantine	Post-Medieval		
Black rat	-	-	-	-	-	1	1
Total	-	-	-	-	-	1	1

12

THE FISH REMAINS

by

Mark J. Beech and Brian Irving

Introduction

The fish remains from Nicopolis represent one of the first systematic collections of fish bone assemblages from an archaeological site in Bulgaria. It provides valuable palaeoenvironmental and palaeoeconomic data, especially important for the Roman to early Byzantine periods. In all, twenty-one fish species have been recorded from the site and this also constitutes one of the most diverse archaeological ichthyofauna for any site in the lower Danube basin. Most of the fish are local, freshwater species and it would seem that little fish was imported from further afield. Mackerel (*Scombrus scombrus*) and flounder (*Platichthys flesus*) are the only marine species attested: the fish could have come from the Mediterranean or, more probably, from the Black Sea. Consequently, it seems that, throughout all periods of occupation, fishing was essentially restricted to the exploitation of the local wild fauna. Only in the case of carp (*Cyprinus carpio*) is there some reason to suspect that it may have been farmed locally (Irving 1993) although there is insufficient evidence to prove that this was certainly the case.

Local rivers

Nicopolis lies at the centre of a region which is a rich source of fish (Fig 1.6). The river Rositsa skirts the site on its southern side and continues east to join the Yantra only *c* 8 km from Nicopolis. The Yantra is 285 km in length and is Bulgaria’s third longest river. There is some variation in the fluvial character of the rivers in the region. On the upper and middle reaches of the Yantra, the river flows across limestone bedrock and, consequently, the water is alkaline and biologically rich. Similar conditions favour its tributary, the Rositsa but it differs from the Yantra in having a gravel bed along its lower reaches.

Methods and quantification

The archaeological fish remains were identified using modern skeletal material from the region. Most of the osteological reference material was collected by Brian Irving from the River Rositsa. Other specimens were kindly donated by Dr. Maria Karapetkova (Fish Department, National Museum of Natural History, Bulgarian Academy of Sciences) who undertook a study of the fish fauna in the Yantra and its tributaries during the late 1960s. All skeletal material was prepared using blow fly maggots as the initial de-fleshing agent, and then the bones were cleaned using an enzyme based detergent. Skeletal preparations were made in the field. Although the first author was responsible for preparing this final report, all identifications and the recording of the archaeological material was carried out by Brian Irving. The availability of local osteological reference material was of particular value since it meant that archaeological specimens could be directly compared with their modern counterparts which might have some morphological traits not found in the same species outside the region.

All archaeological material was recorded using the methodology and standard skeletal element nomenclature proposed by Wheeler and Jones (1989). Where possible, bone measurements were taken

following the procedure recommended by Morales and Rosenlund (1979) although the highly fragmentary condition of the assemblage limited the extent to which this could be done (Appendix 12.1). The following fields were entered in the database: area, context, species/family, skeletal element, bio-symmetrical side, condition, and measurements.

Results

A total of 1,487 fish bone fragments were recovered both by hand during the excavation and by wet sieving bulk samples to 500 microns. Of these, 565 fragments (38%) were identifiable to skeletal element and to family or species (Table 12.1). Most of the assemblage belonged to the late Roman, early Byzantine and post-medieval periods. It is difficult to make intra-site comparisons because the quantity of deposits for any particular period varied markedly from area to area (see above, pp. 4–5). Even so, it seems that the quantities of fish bones recovered appear to be fairly evenly distributed across the site as a whole (Table 12.2). The assemblage included a wide range of anatomical elements (Table 12.3). The dataset on fish biometry is included (Appendix 12.1).

A number of the fish bones had cut marks and breakages indicating butchery. Some of the vertebrae had typical dorso-ventral cuts, indicating that the fish had been filleted and cut down the vertebral column. Neural arches were cut laterally, the rib articulations/attachments cut lengthwise. Most of the large ribs had traces of cut marks close to their proximal articulation.

All the fish bones were carefully examined for traces of digestion, following the recommendations made by Jones (1984). A number of vertebrae had characteristic traces of gnawing and digestion. Several carp (*Cyprinus carpio*) vertebrae had tooth puncture marks and centrum edge contortions which had probably been made by small carnivores. Even after cooking, both the neural and haemal arches of carp vertebrae remain intact, as is also the case with the neural arches of abdominal vertebrae. The damage to the vertebrae is most unlikely to have been caused by human chewing or digestion. Pigs could have digested the bones but the vertebrae would have been chewed and the surviving faecal material would not be so complete as it is if this had happened. Similarly, dogs would have crushed the bones by chewing them. Consequently, it seems most likely that the puncture marks and distorted centrum edges were most likely made by cat (*Felis* sp.), black rat (*Rattus rattus*) or a local large mustelid species such as the beech marten (*Martes foina*).

SPECIES PRESENT – TAXONOMY AND MODERN BIOGEOGRAPHY

ACIPENSERIDAE

Sterlet, *Acipenser ruthenus* Linnaeus, 1758

A sterlet scute was identified in a mid Roman period deposit in area D (667). An articular fragment was noted in area K (4516) and a cranial fragment in area D (604), both from late Roman levels. Sterlets are a fluvial fish that are found typically in large rivers and their lesser tributaries (Vostradovsky 1973). Like other sturgeons, they aggregate in hollows in the river floor during the winter where they are fairly inactive. In spring, when the ice breaks, they rise from the bottom and move upstream to spawn. For spawning, the fish use the main channel of the river, where the current is fast and the bottom is covered with gravel (Berg 1962). This species was probably fished in the Yantra where it can still be caught during the summer months. Today, it is an endangered species (Birstein 1993).

ESOCIDAE

Pike, *Esox lucius* Linnaeus, 1758

Skeletal fragments of pike are most common in deposits dating to the late Roman and early Byzantine periods (Table 12.1). It is a ‘catholic’ species and will be found in all types of rivers wherever prey

Table 12.1 Quantification of fish bones by period at Nicopolis

TAXON	150-175 EARLY ROMAN	150-250 EARLY-MID ROMAN	150-450 EARLY-LATE ROMAN	175-250 MID-ROMAN	175-450 MID-LATE ROMAN	250-450 LATE-ROMAN	250-600 LATE ROMAN – EARLY BYZANTINE	450-600 EARLY BYZANTINE	800-1000 SLAV	POST-MEDIEVAL	UNKNOWN DATE	TOTAL
STERLET, *Acipenser ruthenus* Linnaeus, 1758	-	-	-	1	-	2	-	-	-	-	-	3
PIKE, *Esox lucius* Linnaeus, 1758	1	-	-	1	-	10	2	15	1	2	3	35
SALMON AND TROUT FAMILY, Salmonidae	-	-	-	-	-	-	3	-	-	-	-	3
SEA/BROWN TROUT, *Salmo trutta* Linnaeus, 1758	-	-	-	2	-	3	1	5	1	2	2	16
CARP FAMILY, Cyprinidae	2	-	1	7	-	29	10	36	1	24	20	130
CARP, *Cyprinus carpio* Linnaeus, 1758	6	-	-	11	1	55	42	65	1	22	23	226
CRUCIAN CARP, *Carassius carassius* (Linnaeus, 1758)	-	-	-	-	-	-	1	1	1	-	-	3
TENCH, *Tinca tinca* (Linnaeus, 1758)	-	-	-	-	-	-	-	-	-	2	-	2
COMMON BREAM, *Abramis brama* Linnaeus, 1758	-	-	-	-	-	-	-	-	-	1	-	1
BLEAK, *Alburnus alburnus* (Linnaeus, 1758)	-	-	-	-	-	2	-	-	-	5	-	7
ASP, *Aspius aspius* (Linnaeus, 1758)	-	-	-	-	-	2	-	2	-	2	1	7
BARBEL, *Barbus barbus* (Linnaeus, 1758)	-	-	-	1	-	-	2	3	-	-	-	6
NASE, *Chondrostoma nasus* (Linnaeus, 1758)	-	-	-	-	-	1	-	2	-	1	-	4
IDE, *Leuciscus idus* (Linnaeus, 1758)	-	-	-	-	-	2	-	-	-	-	-	2
CHUB, *Leuciscus cephalus* (Linnaeus, 1758)	-	-	-	-	-	10	3	9	-	6	1	29
MINNOW, *Phoxinus phoxinus* (Linnaeus, 1758)	-	-	-	-	-	1	-	-	-	-	-	1
ROACH, *Rutilus rutilus* (Linnaeus, 1758)	1	-	-	1	-	1	1	6	-	1	-	11
CATFISH / WELS, *Siluris glanis* Linnaeus, 1758	1	-	-	-	-	18	21	14	-	10	4	68
PERCH, *Perca fluviatalis* Linnaeus, 1758	-	-	-	-	-	-	-	1	-	-	-	1
ZANDER, *Sander lucioperca* (Linnaeus, 1758)	-	-	-	-	-	2	-	-	-	-	-	2
EEL, *Anguilla anguilla* Linnaeus, 1758	-	-	-	-	1	1	-	1	-	-	-	3
FLATFISH FAMILY, Pleuronectidae	-	-	-	-	-	-	-	1	-	-	-	1
FLOUNDER, *Platichthys flesus* (Pallas, 1811)	-	-	-	-	-	-	-	1	-	-	-	1
MACKEREL, *Scomber scombrus* Linnaeus, 1758	-	-	-	-	-	-	2	-	-	1	-	3
Indeterminate	50	1	3	44	5	240	59	287	18	101	114	922
TOTAL	**61**	**1**	**4**	**68**	**7**	**379**	**147**	**449**	**23**	**180**	**168**	**1487**

Table 12.2 Quantification of fish bones by area at Nicopolis

TAXON	A	B	C	D	E	F	K	M	P	R	S	TOTAL
STERLET, *Acipenser ruthenus* Linnaeus, 1758	-	-	-	2	-	-	1	-	-	-	-	3
PIKE, *Esox lucius* Linnaeus, 1758	7	1	2	11	7	2	1	1	1	2	-	35
SALMON AND TROUT FAMILY, Salmonidae	-	-	-	-	-	-	-	-	2	1	-	3
SEA/BROWN TROUT, *Salmo trutta* Linnaeus, 1758	4	-	2	6	1	1	-	1	1	-	-	16
CARP FAMILY, Cyprinidae	20	10	7	50	23	4	3	-	11	2	-	130
CARP, *Cyprinus carpio* Linnaeus, 1758	21	5	26	64	23	17	10	16	38	5	1	226
CRUCIAN CARP, *Carassius carassius* (Linnaeus, 1758)	1	-	-	-	-	1	-	-	1	-	-	3
TENCH, *Tinca tinca* (Linnaeus, 1758)	-	-	-	-	-	-	-	-	-	2	-	2
COMMON BREAM, *Abramis brama* Linnaeus, 1758	-	-	-	1	-	-	-	-	-	-	-	1
BLEAK, *Alburnus alburnus* (Linnaeus, 1758)	-	-	-	7	-	-	-	-	-	-	-	7
ASP, *Aspius aspius* (Linnaeus, 1758)	-	-	2	3	1	1	-	-	-	-	-	7
BARBEL, *Barbus barbus* (Linnaeus, 1758)	1	-	1	-	2	-	-	-	2	-	-	6
NASE, *Chondrostoma nasus* (Linnaeus, 1758)	-	1	-	1	2	-	-	-	-	-	-	4
IDE, *Leuciscus idus* (Linnaeus, 1758)	-	-	-	2	-	-	-	-	-	-	-	2
CHUB, *Leuciscus cephalus* (Linnaeus, 1758)	-	1	3	9	6	6	1	-	3	-	-	29
MINNOW, *Phoxinus phoxinus* (Linnaeus, 1758)	-	-	-	1	-	-	-	-	-	-	-	1
ROACH, *Rutilus rutilus* (Linnaeus, 1758)	1	1	4	2	3	-	-	-	-	-	-	11
CATFISH / WELS, *Siluris glanis* Linnaeus, 1758	5	-	15	11	5	4	6	5	15	2	-	68
PERCH, *Perca fluviatalis* Linnaeus, 1758	-	-	-	1	-	-	-	-	-	-	-	1
ZANDER, *Sander lucioperca* (Linnaeus, 1758)	-	-	-	2	-	-	-	-	-	-	-	2
EEL, *Anguilla anguilla* Linnaeus, 1758	1	1	-	1	-	-	-	-	-	-	-	3
FLATFISH FAMILY, Pleuronectidae	-	-	-	-	-	1	-	-	-	-	-	1
FLOUNDER, *Platichthys flesus* (Pallas, 1811)	-	-	-	-	-	1	-	-	-	-	-	1
MACKEREL, *Scomber scombrus* Linnaeus, 1758	-	-	-	-	-	-	-	1	-	2	-	3
Indeterminate	118	134	113	301	104	73	12	16	46	5	-	922
TOTAL	**179**	**154**	**175**	**475**	**177**	**111**	**34**	**40**	**120**	**21**	**1**	**1487**

Table 12.3 Quantification of fish bones by anatomical element at Nicopolis

TAXON / ANATOMICAL ELEMENT	ABDOMINAL VERTEBRA	ARTICULAR	BASIOCIPITAL	BRANCHIOSTEGAL	CAUDAL VERTEBRA	CENTRUM	CERATOHYAL	CERVICAL VERTEBRA	CLEITHRUM	CRANIAL FRAG.	DENTARY	DORSAL FINSPINE	EPIHYAL	EXOCCIPITAL	FIN SPINE	FIRST VERTEBRA	HAEMAL/ NEURAL ARCH	HYOMANDIBULAR	HYPOBRANCHIAL	HYPOHYAL	HYPURAL
STERLET	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
PIKE	6	-	-	-	4	-	-	1	11	-	5	-	-	-	-	-	-	-	-	-	-
SALMON AND TROUT FAMILY	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
SEA/BROWN TROUT	6	1	-	-	4	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-
CARP FAMILY	24	2	-	-	66	-	1	5	-	2	-	2	-	-	1	5	1	-	-	-	2
CARP	16	1	3	-	40	-	2	5	11	-	10	25	0	1	-	3	-	3	-	-	2
CRUCIAN CARP	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
TENCH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMMON BREAM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BLEAK	1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASP	-	1	-	-	1	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-
BARBEL	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHUB	3	3	-	-	2	-	-	-	1	-	-	-	-	-	-	1	-	-	-	1	-
MINNOW	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ROACH	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	1	-	-	-	-	-
CATFISH / WELS	16	-	-	-	12	2	1	4	3	-	-	1	1	-	21	1	-	-	1	-	-
PERCH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZANDER	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EEL	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FLATFISH FAMILY	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FLOUNDER,	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MACKEREL,	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeterminate	2	-	-	-	2	9	-	1	5	182	1	4	-	-	1	-	10	-	-	-	-
TOTAL	76	11	3	1	146	11	4	18	32	185	16	36	1	1	23	14	11	3	1	1	4

TAXON / ANATOMICAL ELEMENT	INFRAPHARYNGEAL	INTEROPERCULAR	MAXILLA	OPERCULAR	OPISTHOTIC	OS SUSPENSORIUM	PALATINE	PENULTIMATE VERTEBRA	PHARYNGEAL BONE + TEETH	PHARYNGEAL TOOTH	POST-CRANIAL FRAG.	POSTCLEITHRUM	POSTTEMPORAL	PREMAXILLA	PREOPERCULAR	PTERYGIOPHORE	RIB	SCALE	SCUTE	SUBOPERCULAR	SUPRAPHARYNGEAL	TOOTH	UROSTYLE	TOTAL
STERLET	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	3
PIKE	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	4	-	35
SALMON AND TROUT FAMILY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
SEA/BROWN TROUT	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	16
CARP FAMILY	2	-	1	2	-	-	-	1	-	-	-	1	-	-	-	-	8	-	-	1	1	-	2	130
CARP	7	3	1	7	-	8	-	-	11	10	-	2	1	-	5	1	39	2	-	2	3	1	1	226
CRUCIAN CARP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
TENCH	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2
COMMON BREAM	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
BLEAK	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	7
ASP	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	7
BARBEL	-	-	1	1	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
NASE	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	4
IDE	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CHUB	-	-	-	-	-	1	-	-	5	3	-	-	-	-	-	-	-	4	-	-	5	-	-	29
MINNOW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
ROACH	1	-	-	-	-	-	-	-	1	2	-	-	-	1	-	-	-	-	-	-	-	1	-	11
CATFISH / WELS	-	1	-	-	1	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	68
PERCH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
ZANDER	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
EEL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
FLATFISH FAMILY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
FLOUNDER,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
MACKEREL,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Indeterminate	-	-	-	-	-	-	-	-	-	-	24	-	-	-	-	-	680	-	-	-	1	-	-	922
TOTAL	11	4	3	10	1	9	3	2	27	20	24	3	1	4	7	1	727	7	1	3	10	7	4	1487

species are present. The pike is the main pisciverous predator and usually feeds on shoaling cyprinids. Karapetkova (1972, 1976) reports that they could be caught in the Yantra and the author has seen them in the Rositsa. The pike is a common species throughout the Danube basin and across most of Eurasia (Maitland 1977).

Pike bones came from almost all areas. Since both cranial and vertebral elements were found, it seems that whole fish were brought to the site. By comparing the remains with specimens in the reference collection, the pike must have been from 50cm to 90cm fork length.

SALMONIDAE

Three vertebrae fragments could only be generally attributed to the salmon and trout family. These came from late Roman/early Byzantine deposits in area P (5050) and area R (5218).

Sea/Brown Trout – *Salmo trutta* Linnaeus, 1758

Bones from sea/brown trout were recorded in mid Roman, late Roman, early Byzantine, Slav and post-medieval levels. This species occurred in small quantities in most of the excavation areas. Sea trout generally prefer cold, well-oxygenated upland waters; especially large streams in mountainous areas where there is adequate cover in the form of submerged rocks, undercut banks, or overhanging vegetation.

CYPRINIDAE

The Cyprinidae form the largest group of remains from the site, although 142 fragments cannot be assigned to species. Most of the fragments within this group are vertebrae that are difficult, and in some cases impossible, to assign to species even when the finds are undamaged. They appear in most periods and were found in almost all areas.

Carp, *Cyprinus carpio* Linnaeus, 1758

Carp tolerates a wide variety of conditions but generally prefers wide expanses of water with a slack current or standing water, as well as soft bottom sediments. Common carp thrive in large turbid rivers (Kottelat 1997). The remains of carp constitute the most common of all the fish species from Nicopolis: a total of 226 fragments were recorded. It has been found in all periods. A striking characteristic of this material is that the size of the vertebrae is remarkably uniform (Fig 12.1). This suggests that most of the fish caught were of about the same size. One explanation might be that carp were caught using nets with a mesh of standard size which allowed the smaller fish to escape. However, this would seem unlikely since carp were found in contexts which also produced smaller fish of other species, and those evidently had not been discarded on the grounds that they were too small to eat. An alternative explanation could be that the fish were farmed in ponds and culled only when they were considered to have reached an appropriate size. It has been argued that carp may have been farmed at Nicopolis or nearby (Irving 1993). However, it is singularly difficult to prove domestication from archaeological finds. Although the archaeological material was compared with evidence from modern domestic and wild carp to estimate age and standard fish size reconstructions were made, none of this evidence provides conclusive evidence for farming. Further information about the age and size of modern carp populations in the region is needed before a database of sufficient size could be compared directly with the archaeological material. Unfortunately, this was not feasible during the limited time available for fieldwork.

Crucian Carp, *Carassius carassius* (Linnaeus, 1758)

Only three fragments were identified as belonging to this species although today it is frequently caught in the Rositsa. The fragments came from late Roman, early Byzantine and Slav deposits. The crucian carp is a medium-sized fish usually weighing between one and two kilograms. It is a shoaling species, which may have been recently introduced to the Rositsa since its natural habitat is usually lakes and very slow moving rivers.

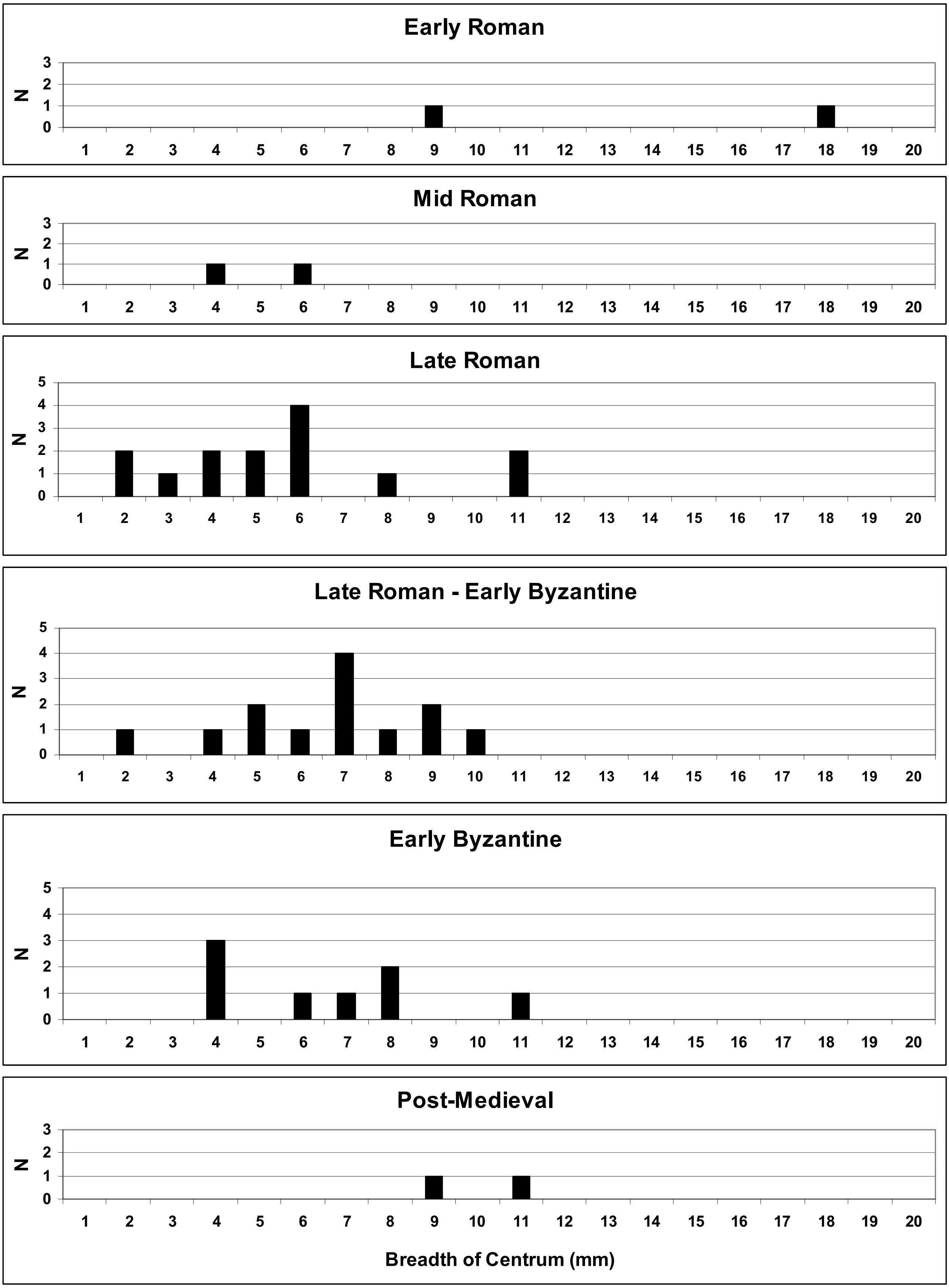


Fig. 12.1 Maximum breadth of the common carp caudal vertebrae at Nicopolis

Tench, *Tinca tinca* (Linnaeus, 1758)
Two pharyngeal teeth of tench were found in a post-medieval level (area R, 5206). This species is commonly found in those parts of rivers where the water is flowing slowly and full of silt. It also lives in warm lakes and pools with weed and mud bottoms. Consequently, this fish is more likely to have been caught in the Yantra than the Rositsa. Not surprisingly, tench do not live in the Rositsa today but Karapetkova (1972, 1976) recorded that the species was to be found in the Yantra.

Common Bream, *Abramis brama* (Linnaeus, 1758)
This species is represented by a single pharyngeal tooth from a post-medieval occupation level (area D, 489). It came from a large individual, three to five kilograms in weight, judging by modern comparative material. This species occurs usually in still and slow flowing waters where it moves in large shoals (Vostradovsky 1973). Although this species is rare at the present time it has been recorded at the mouth of the Yantra (Karapetkova 1972, 1976). Probably, this archaeological find came from the same location or from the Danube itself.

Bleak, *Alburnus alburnus* (Linnaeus, 1758)
Bleak was identified in both late Roman (540) and post-medieval deposits (421 and 429, area D). A number of bones, particularly vertebrae within the group identified as Cyprinus sp., are probably from this species, given their generally small size. The bleak is a small, shoaling, surface feeder and is the smallest fish still caught in the Rositsa and eaten by the local inhabitants. These examples were certainly caught close to the site since their small size would not make them suitable for sale at any distance from where they were caught.

Asp, *Aspius aspius* (Linnaeus, 1758)
Seven fragments of asp have been identified from late Roman, early Byzantine and post-medieval deposits in areas C, D, E and F. This is a large fish and a predator which feeds on smaller cyprinids. It generally inhabits the lower reaches of rivers and estuaries, preferring to stay near bridge pillars, near the mouths of tributaries, under weirs, in deep currents, overgrown parts of the river and in quiet bays in river bends (Vostradovsky 1973). At the present time this species is found in the Danube and at the mouth of the Yantra.

Barbel, *Barbus barbus* (Linnaeus, 1758)
Six fragments have been identified as belonging to barbel from late Roman and early Byzantine levels in areas A, C, E and P. This species lives in the deeper, faster-flowing upper reaches of rivers with stony or gravel bottoms. It is common in both the Yantra and Rositsa.

Nase, *Chondrostoma nasus* (Linnaeus, 1758)
Nase came from late Roman, early Byzantine and post-medieval deposits in areas B, D and E. This fish is distributed widely across Central and Eastern Europe and is found in the Rhine and in the Danube river basins. Nase is a gregarious species, which occurs in fairly shallow water with fast currents, often beside the swirls created by piles of bridges or rocks (Billard 1997). It migrates upstream and enters smaller tributaries for spawning in shallow water with a gravel bed.

Ide, *Leuciscus idus* (Linnaeus, 1758)
Ide, or orfe as it is sometimes called, was present in late Roman levels in area D (544). This species lives in schools and its natural habitat includes clear pools in medium to large and slow-moving rivers, ponds and lakes. Ide enters rivers in spring to spawn over gravel or vegetation. In some quarters the flesh of this fish is not considered suitable for human consumption (Billard 1997), although today it remains an important commercial fish in Eastern Europe and Russia.

Chub, ***Leuciscus cephalus*** (Linnaeus, 1758)
The chub is well represented in late Roman, early Byzantine and post-medieval levels. Chub can be found both in creeks and fast flowing rivers, occasionally in lakes. This fish is typically ‘catholic’ with regard to food and habitat requirements and consequently is found in a wide variety of fluvial conditions. Karapetkova (1972, 1976) reported that it was the most common species caught in the Yantra and its

tributaries. When the author carried out fieldwork in the late 1980s it was found to be still very common in the region. The usual size range for the modern population is around 30–40cm, and, the vertebral measurements of the archaeological material suggests that chub in Antiquity were much the same size as they are today.

Minnow, *Phoxinus phoxinus* (Linnaeus, 1758)
A single abdominal vertebra of a minnow was identified. It came from a late Roman deposit in area D (540). This species prefers cold, well-oxygenated waters such as those found in fast-flowing streams and rivers, or cooler lakes with clear water over a gravel substrate. It is unable to survive in stagnant pools or ditches. Minnows migrate upstream to spawn in shallow water with a gravel riverbed.

Roach, *Rutilus rutilus mariza* (Drensky 1926)
Roach bones occur in deposits in areas A through to E and which date to most periods from early Roman to post-medieval. This species inhabits slow flowing or still, muddy waters. It is abundant in reservoirs, lakes, canals, and rivers. There are brackish water anadromous populations which live in the Baltic and the Black Sea (Muus and Dahlström 1968). Roach can thrive in poor quality, even polluted water, and congregate in large shoals within slow moving rivers.

SILURIDAE

Wels Catfish, *Siluris glanis* Linnaeus, 1758
The wels catfish is represented by 68 fragments. It occurs in almost all site periods and all excavation areas. This species is common throughout Eastern Europe, Asia Minor and Central Asia. The fish is found mainly in large lakes and rivers, though occasionally it may enter brackish water in the Baltic and Black Sea (Frimodt 1995). Today, the wels catfish can be found in deep water in front of dams constructed on the lower reaches of rivers, and is known to feed at night on voles, crayfish, small fishes and even on ducks (Vostradovsky 1973).

Skeletal material in the Natural History Museum in Sofia indicate that, in the region, this fish varied from as little as 20cm to as much as 200cm in length. There are even modern reports of catfish from Eastern Europe which are as much as 5m long and weigh 300 kgs.

The pectoral fin spines of this species are over-represented in the assemblage when compared with the other skeletal elements. It is striking that spines comprise *c* 80% of the remains of this fish. Skeletal element representation shows a significant imbalance in favour of pectoral spines. A catfish has 65 vertebrae and 2 pectoral spines, a ratio of 32.5. But, within several contexts producing catfish bones, the ratio is 2:1 in favour of spines. A possible bias in recovery, favouring the preservation of the larger bones, cannot explain this imbalance because vertebrae from other species, which in most cases are less robust, have been identified in contexts which also contained catfish. Another possible reason for this predominance of fin spines is if the filleting of fish was confined to a particular part of the site which has not been excavated. This also seems unlikely to have been the case since, in general terms, fish vertebrae are well represented in all areas and most contexts, suggesting that the processing of fish and waste disposal was not concentrated in one place. The pectoral fin spines are broken at the junction between the proximal articulation and the supra cleithrum. This is reminiscent of the practice attested in dynastic and pre-dynastic Egypt, when wall-paintings depicted the butchery of Nile catfish (*Clarias sp*.) and the removal of its spines (von den Driesch 1983). The pectoral fin spine has a serrated trailing (posterior) edge which is embedded in the epithelium of the pectoral fin. Slight cuts at the distal end of these spines suggest that they were carefully removed from the epitheloid mucosa. It therefore seems probable that spines were being collected to serve a particular function and were not thrown away along with the rest of the fishbone waste (Irving 1992). Perhaps they were collected for use as combs or as tools with which to decorate pottery.

PERCIDAE

Perch, *Perca fluviatalis* Linnaeus, 1758
One scale fragment of a perch was identified in an early Byzantine context. Perch live in slow-flowing rivers, deep lakes and ponds, and are often found close to, or amongst, obstacles in the water. It generally avoids cold, fast flowing waters but, although it does not breed in such conditions, may occasionally be found there. The species is found in the Rositsa at the present time.

Zander, *Sander lucioperca* (Linnaeus, 1758)
The zander, or pikeperch, is only represented by two bone fragments, both from late Roman contexts. This species generally inhabits slowly moving or stagnant water over two metres deep. Its modern habitat includes lakes, reservoirs, canals and rivers. Other archaeological sites on the Lower Danube have produced significant quantities of this species.

ANGUILLIDAE

Eel, *Anguilla anguilla* Linnaeus, 1758
Three vertebrae of eel were found in mid Roman and late Roman levels. The common eel lives in nearly every kind of water, from large lakes and rivers to small ponds and ditches. Young eels spend their growing period in freshwater and can be caught in small streams and ditches, whilst the larger eels live in the soft mud. The males stay in freshwater for 6–12 years, the females 9–20 years. When fully grown, they become sexually mature and migrate to the sea where they are to be found in deep waters. They live on the bottom, under stones, in the mud or in crevices (Deelder 1984). The eel is a migratory species and reaches the Danube and its tributaries from the Black Sea. Today, as no doubt in Antiquity, it is common in rivers close to the site.

PLEURONECTIDAE

A single bone fragment from a flatfish was found in an early Byzantine context. This could not be identified beyond family level. It is likely that this is from an imported marine species; as such fish are unlikely to have ventured as far up the Danube as the Yantra or Rositsa.

Flounder, *Platichthys flesus* (Pallas 1811)
One flounder bone fragment was identified in an early Byzantine context. This must have come from the Black Sea or the mouth of the Danube. Flounder can survive in freshwater but it is unlikely to have come this far up the Danube and then up the Yantra. Juveniles live in shallow coastal waters and estuaries which are also the summer feeding grounds for adults. During the winter, adults retreat to deeper, warmer, waters where they spawn in the spring (Cooper and Chapleau 1998).

SCOMBRIDAE

Mackerel, *Scomber scombrus* Linnaeus, 1758
Mackerel were represented by three vertebrae from late Roman/early Byzantine and post-medieval occupation levels. This species is a fully marine pelagic shoaling species which can be found both in the Black Sea and the Mediterranean today. Its preferred habitat is cold and temperate shelf areas, where it congregates in large schools near the surface. The mackerel overwinters in deeper waters but moves closer inshore during the spring when water temperatures rise (Collette and Nauen 1983).

Although only a small number of identified fragments were recovered from the excavations, the fact that this fish must have been transported over a considerable distance to reach the site, is reason enough to suggest that it was regarded as a delicacy.

Discussion

Analysis of the fish bones from Nicopolis indicates that both the Rositsa and the Yantra played an important role in providing local fish for the inhabitants of the site during all periods of occupation.

During the Roman period, the local rivers supplied the great majority of the fish for the city, although carp and catfish were probably also brought from the Danube and mackerel perhaps from the Black Sea. Carp would seem to have been the preferred species, followed by catfish. This situation is still true today; local fishermen are most interested in catching carp or catfish. Local fish markets, in addition to these freshwater fishes, usually also sell some marine species such as mackerel. During the late Roman and early Byzantine periods there appears to have been an increased interest in carp (Table 12.1). However, species diversity also increases during the late Roman and especially during the early Byzantine periods. Only a total of 23 fragments were identified from deposits attributed to the Slav period, too small a sample for comparison with assemblages from other periods. During the post-medieval period, carp and catfish are again the dominant species, although it seems that, much as today, a wide range of other local fishes were being caught.

During the 1990 and 1991 seasons, the author and Brian Irving carried out a basic survey of the river Rositsa. This involved regular fishing trips using rod and line, as well as hand nets. The results suggest that there has not been any significant change in the fish community since the Roman period. Today, villagers still exploit this local resource, fishing with nets or rod and line. Also, as in the Roman period, all kinds of fish are killed and eaten, regardless of species and size.

In the 1960s a comprehensive study was undertaken on the fishes of the river Yantra (Karapetkova 1972, 1976). Comparing the results of this modern data (Karapetkova 1972, 1976, Karapetkova and Zivkov 1995) with the archaeological assemblages equally suggests that species diversity, as well as community structure, is similar today to what it had been in the Roman period. It is notable that certain species are more dominant in some rivers than in others. For example, chub is the most common medium-sized species in the river Rositsa and it is therefore probably no coincidence that this fish appears to have been common in late Roman, early Byzantine and post-medieval contexts.

The possibility that carp may have been farmed is of particular interest. Pisciculture, and, in particular, the rearing of carp was of importance to monastic communities in medieval Europe. It may be, because of the difficulties inherent in proving that the fish was kept in captivity, we have underestimated the importance of fish farming in the Roman period.

The catfish, measuring up to two metres in length, probably represent ‘prestige’ specimens which must have been imported from further afield. They may well have been caught at the mouth of the Yantra or in the Danube. Although, as discussed above, the pectoral spines may have been used as tools and were imported as such, the fact that 70% of the catfish remains were not pectoral fin spines proves that the fish itself must have been eaten at Nicopolis (Irving 1992).

Many of the smaller fish species identified, such as smaller cyprinids, probably formed part of the everyday diet of the ancient inhabits which, as noted above, is still the common practice in the region; all fish caught is eaten irrespective of type or size.

Comparison with other sites

Unfortunately most archaeological excavations carried out in this region have not employed systematic retrieval methods to collect fish remains. The lack of sieving almost certainly explains the absence of fish bones in published archaeological faunal assemblages. The evidence from those few published sites which record the discovery of fish bones is summarised in Table 12.4. At first inspection, it appears that Nicopolis has by far the richest assemblage, in quantity and variety of species. However, it is probable that this can be explained, in part at least, by the general failure to use appropriate retrieval methods; using only hand recovery inevitably produces a bias in the fish taxa in favour of the larger species, such as catfish, pike and carp.

At the nearby late Roman to early Byzantine fort of Dichin, pike appear to have been the most common fish in the assemblage (see above, p. 14). Since sieving was here used in the retrieval of bone finds, it is reasonable to expect that the final publication will produce a list of species of no less importance than that from Nicopolis. Common carp and catfish were recognized at Ratiaria (Archar), a Roman to late Roman city on the Danube (Iliev *et al* 1993), and on the site of a Roman villa of Bela

Table 12.4 Comparison of fish bone assemblages in Bulgaria and neighbouring regions

SITE	NICOPOLIS	DICHIN	IATRUS	NOVAE	NOVAE	NOVAE	NOVAE	NOVAE	RATIARIA	BELA VODA, PERNIK	ÁCS-VASPUSZTA	TÁC-GORSIUM
COUNTRY	**BULGARIA**	**BULGARIA**	**BULGARIA**	**BULGARIA**	**BULGARIA**	**BULGARIA**	**BULGARIA**	**BULGARIA**	**BULGARIA**	**BULGARIA**	**HUNGARY**	**HUNGARY**
DATE	**2^{nd}-5^{th} cent.**	**5^{th}-6^{th} cent.**	**4^{th}-5^{th} cent.**	**2^{nd} –6^{th} cent.**	**2^{nd} –6^{th} cent.**	**2^{nd}-3^{rd}/4^{th} cent.**	**4^{th}-6^{th} cent.**	**6^{th}/7^{th}-10^{th} cent.**	**2^{nd}-4^{th} cent.**	**3^{rd}-6^{th} cent.**	**2^{nd} – early 5^{th} cent.**	**1^{st}-4^{th} cent.**
TYPE OF SITE	**Settlement**	**Settlement**	**Settlement**	**Western Sector 1972 – Forum, Northern Gate, Western Gate**	**Western Sector 1974 – Forum, Northern Gate**	**Western Sector 1988, 1990, 1993 - Basilica**	**Western Sector - 1988, 1990, 1993 -Basilica**	**Western Sector - 1988, 1990, 1993 - Basilica**	**Settlement**	**Villa**	**Fort**	**Settlement**
REFERENCE	**Beech and Irving, this report**	**Andy Hammond, pers.comm.**	**Bartosiewicz and Choyke 1991, 1995**	**Schramm 1975**	**Schramm 1979**	**Makowiecka and Iwaszkiewicz 1996**	**Makowiecka and Iwaszkiewicz 1996**	**Makowiecka and Iwaszkiewicz 1996**	**Iliev et al., 1993**	**Iliev et al., 1992**	**Bartosiewicz, 1989**	**Bökönyi, 1984**
WHITING, *Merlangius merlangus* (Linnaeus, 1758)	-	-	-	-	-	-	4	-	-	-	-	-
STERLET, *Acipenser ruthenus* Linnaeus, 1758	Present	-	-	2	-	-	-	-	-	-	-	-
GREAT STURGEON, Huso huso (Linnaeus, 1758)	-	-	-	-	3	-	12	2	-	-	1	-
PIKE, *Esox lucius* Linnaeus, 1758	Common	-	-	5	5	5	16	2	-	-	1	9
SALMON AND TROUT FAMILY, Salmonidae	Present	-	-	-	-	-	-	-	-	-	-	-
SEA/BROWN TROUT, *Salmo trutta* Linnaeus, 1758	Present	-	-	-	-	-	-	-	-	-	-	-
CARP FAMILY, Cyprinidae	Frequent	Present	-	-	-	-	-	-	-	1	-	-
CARP, *Cyprinus carpio* Linnaeus, 1758	Frequent	-	6	4	10	-	8	-	3	-	7	12
CRUCIAN CARP, *Carassius carassius* (Linnaeus, 1758)	Present	-	-	-	-	1	3	-	-	-	-	-
TENCH, *Tinca tinca* (Linnaeus, 1758)	Present	-	-	-	-	-	-	-	-	-	-	-
COMMON BREAM, *Abramis brama* Linnaeus, 1758	Present	-	-	-	-	1	6	-	-	-	-	-
BLEAK, *Alburnus alburnus* (Linnaeus, 1758)	Present	-	-	-	-	-	-	-	-	-	-	-
ASP, *Aspius aspius* (Linnaeus, 1758)	Present	-	-	-	-	-	-	-	-	-	-	-
BARBEL, *Barbus barbus* (Linnaeus, 1758)	Present	-	-	-	-	-	-	-	-	-	-	-
NASE, *Chondrostoma nasus* (Linnaeus, 1758)	Present	-	-	-	-	-	-	-	-	-	-	-
IDE, *Leuciscus idus* (Linnaeus, 1758)	Present	-	-	-	-	-	-	-	-	-	-	-
CHUB, *Leuciscus cephalus* (Linnaeus, 1758)	Present	-	-	-	-	-	-	-	-	-	-	-
MINNOW, *Phoxinus phoxinus* (Linnaeus, 1758)	Present	-	-	-	-	-	-	-	-	-	-	-
ROACH, *Rutilus rutilus* (Linnaeus, 1758)	Present	-	-	-	-	-	-	-	-	-	-	-
CATFISH / WELS, *Siluris glanis* Linnaeus, 1758	Common	Present	11	13	19	4	14	2	1	2	-	29
PERCH, *Perca fluviatalis* Linnaeus, 1758	Present	-	-	3	-	-	-	-	-	-	-	-
ZANDER, *Sander lucioperca* (Linnaeus, 1758)	Present	-	-	4	1	1	-	-	-	-	1	-
EEL, *Anguilla anguilla* Linnaeus, 1758	Present	-	-	-	-	-	-	-	-	-	-	-
FLATFISH FAMILY, Pleuronectidae	Present	-	-	-	-	-	-	-	-	-	-	-
FLOUNDER, *Platichthys flesus* (Pallas, 1811)	Present	-	-	-	-	-	-	-	-	-	-	-
MACKEREL, *Scomber scombrus* Linnaeus, 1758	Present	-	-	-	-	-	-	-	-	-	-	-
TOTAL	**565**	**?**	**17**	**31**	**38**	**12**	**63**	**6**	**4**	**3**	**10**	**50**

Voda near Pernik (Iliev *et al* 1992). Carp and catfish were also identified amongst the fish bones from the 1970–72 excavations on the site of the late Roman fort of Iatrus (Krivina) on the Danube (Bartosiewicz and Choyke 1991, 1995). Small assemblages from the Polish teams' excavations at Novae (Svishtov) have also been published (Schramm 1975, 1979, Szymczyk 1987; Makowiecki and Iwaszkiewicz 1996, Makowiecki 1999). This material suggests that a broadly similar pattern of exploitation existed across the region. Species included; pike, carp and catfish in particular although sturgeon, bream, zander and whiting are also represented. In the case of Novae, as now at Nicopolis, it has been suggested that carp may have been raised in fish tanks, if not at Novae itself, then in the vicinity (Makowiecki and Iwaszkiewicz 1996, 53). The sample of fish remains from Sector II at Novae comprised 51.5% carp (Szymczyk 1987).

However, the evidence from Novae does indicate some notable differences between this site and Nicopolis. In particular, Novae produced the bones of very large sturgeon and catfish. No doubt, this is explained by the fact that this site is actually on the Danube bank and the resources of this great river were more readily available there than at Nicopolis (Fig 1.5). Also of interest, is the appearance of the whiting (*Merlangius merlangus*), a species belonging to the cod family (*Gadidae*) in the assemblage from Novae, a fish not attested at Nicopolis. It is found in both European Atlantic waters and in the Mediterranean; no doubt the location of Novae on a major river with direct access to the sea facilitated the importation of marine species.

Small quantities of fish remains have also been identified at a number of sites in Pannonia (modern day Hungary) on the Danubian limes site of Ács-Vaspuszta, as well in the interior, at Tac-Gorsium (Bartosiewicz 1989, Bökönyi 1984). Pike and carp were recorded at the former site and, notably, catfish at the latter.

Conclusions

During the Roman, late Roman and early Byzantine periods, Nicopolis appears to have been largely self-sufficient in fish, most of which could have been obtained from rivers in the locality. There is little evidence to suggest any major trade in fish from further afield, even though some marine species did reach the site, apparently in small quantities. The possibility that carp farming existed is of interest; it may explain why this species seems to have been the most commonly eaten fish. The apparent dietary preference for carp over the more common smaller species may also have been influenced by other cultural or dietary factors. At Nicopolis, small, local fish were also eaten and this source of food may have fulfilled an important role as a stop-gap which could be exploited when other fish were not available. The only fish which must have been imported from outside the region were catfish, flounder and mackerel. These species may have been available as an occasional delicacy.

It is to be hoped that more fish bone assemblages from archaeological sites in Bulgaria will be studied in the future. There is a need for well-retrieved (ie sieved) assemblages from well-dated, stratified levels if we are to learn more about the economic role played by fish in the ancient world.

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APPENDIX 12.1 FISH BIOMETRY

All measurements taken follow those defined by Morales and Rosenlund (1979).

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
EARLY ROMAN	150 – 175	*Esox lucius* Linnaeus, 1758	Pike	Abdominal Vertebra	8.2	8.4	4.7
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Esox lucius* Linnaeus, 1758	Pike	Abdominal Vertebra	8.4	8.8	7.3
EARLY BYZANTINE	450 – 600	*Esox lucius* Linnaeus, 1758	Pike	Abdominal Vertebra	10.0	10.1	5.8
POST-MEDIEVAL	1750 – 1850	*Esox lucius* Linnaeus, 1758	Pike	Abdominal Vertebra	8.1	8.8	5.3
POST-MEDIEVAL	1750 – 1850	*Esox lucius* Linnaeus, 1758	Pike	Abdominal Vertebra	10.8	11.5	5.8
LATE ROMAN	250 – 450	*Esox lucius* Linnaeus, 1758	Pike	Caudal Vertebra	8.0	9.1	0.0
EARLY BYZANTINE	450 – 600	*Esox lucius* Linnaeus, 1758	Pike	Caudal Vertebra	7.9	8.8	0.0

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
LATE ROMAN – EARLY BYZANTINE	250 – 600	Salmonidae	Salmon and Trout family	Caudal Vertebra	8.0	7.9	6.5
LATE ROMAN – EARLY BYZANTINE	250 – 600	Salmonidae	Salmon and Trout family	Caudal Vertebra	8.3	8.4	7.1
LATE ROMAN – EARLY BYZANTINE	250 – 600	Salmonidae	Salmon and Trout family	First vertebra	6.5	7.4	5.8

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
LATE ROMAN	250 – 450	*Salmo trutta* Linnaeus, 1758	Sea/Brown trout	Abdominal Vertebra	0.0	0.0	4.2
POST-MEDIEVAL	1750 – 1850	*Salmo trutta* Linnaeus, 1758	Sea/Brown trout	Abdominal Vertebra	4.1	3.8	3.6
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Salmo trutta* Linnaeus, 1758	Sea/Brown trout	Caudal Vertebra	5.2	5.4	5.0
EARLY BYZANTINE	450 – 600	*Salmo trutta* Linnaeus, 1758	Sea/Brown trout	Penultimate vertebra	4.9	5.9	2.6

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
LATE ROMAN	250 – 450	Cyprinidae	Carp family	Abdominal Vertebra	3.1	3.2	3.8
LATE ROMAN – EARLY BYZANTINE	250 – 600	Cyprinidae	Carp family	Abdominal Vertebra	4.4	4.6	4.3
LATE ROMAN – EARLY BYZANTINE	250 – 600	Cyprinidae	Carp family	Abdominal Vertebra	4.8	5.1	4.1
LATE ROMAN – EARLY BYZANTINE	250 – 600	Cyprinidae	Carp family	Abdominal Vertebra	4.8	6.2	4.8
EARLY BYZANTINE	450 – 600	Cyprinidae	Carp family	Abdominal Vertebra	7.1	4.3	3.2
MID ROMAN	175 – 250	Cyprinidae	Carp family	Caudal Vertebra	4.1	4.1	0.0
LATE ROMAN	250 – 450	Cyprinidae	Carp family	Caudal Vertebra	2.9	2.8	3.0
LATE ROMAN	250 – 450	Cyprinidae	Carp family	Caudal Vertebra	3.1	2.9	2.9
LATE ROMAN	250 – 450	Cyprinidae	Carp family	Caudal Vertebra	3.3	3.7	3.9
LATE ROMAN	250 – 450	Cyprinidae	Carp family	Caudal Vertebra	4.0	4.0	4.1
LATE ROMAN	250 – 450	Cyprinidae	Carp family	Caudal Vertebra	4.8	5.4	4.8
LATE ROMAN – EARLY BYZANTINE	250 – 600	Cyprinidae	Carp family	Caudal Vertebra	2.8	2.9	2.8
LATE ROMAN – EARLY BYZANTINE	250 – 600	Cyprinidae	Carp family	Caudal Vertebra	4.5	4.6	4.5
LATE ROMAN – EARLY BYZANTINE	250 – 600	Cyprinidae	Carp family	Caudal Vertebra	4.7	5.1	4.4
EARLY BYZANTINE	450 – 600	Cyprinidae	Carp family	Caudal Vertebra	3.7	4.0	3.4
EARLY BYZANTINE	450 – 600	Cyprinidae	Carp family	Caudal Vertebra	3.8	4.3	4.4
EARLY BYZANTINE	450 – 600	Cyprinidae	Carp family	Cervical Vertebra	4.5	5.0	4.6
LATE ROMAN	250 – 450	Cyprinidae	Carp family	First vertebra	4.2	4.3	3.5
LATE ROMAN – EARLY BYZANTINE	250 – 600	Cyprinidae	Carp family	First vertebra	6.6	7.1	6.2

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
MID ROMAN	175 – 250.	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	3.9	4.2	3.8
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	4.1	4.4	4.5
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	5.6	5.6	4.6
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	9.9	11.6	0.0
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	8.0	9.8	0.0
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	11.0	13.4	11.3
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	11.2	13.5	11.4
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	4.1	4.8	4.1
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	4.6	4.6	4.4
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	5.7	6.4	5.4
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	6.4	7.4	0.0
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	6.5	8.6	6.6
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	7.3	8.0	7.4
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	9.4	10.7	8.2
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	Abdominal Vertebra	13.0	13.8	11.4
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Basioccipital	8.9	10.6	0.0
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Basioccipital	6.2	7.2	0.0
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	Basioccipital	17.6	13.5	0.0
EARLY ROMAN	150 – 175	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	9.3	9.8	8.3
EARLY ROMAN	150 – 175	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	16.8	18.1	14.1
MID ROMAN	175 – 250	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	4.9	6.4	4.6
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	4.4	4.5	4.4
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	5.0	5.2	4.4
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	5.6	6.6	5.8
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	5.8	6.1	5.7
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	7.6	6.6	0.0
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	8.2	8.6	7.7
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	10.9	11.0	9.6
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	11.7	11.9	10.7
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	5.6	5.4	5.4
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	6.4	6.1	0.0
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	6.6	7.3	6.3
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	7.4	8.4	7.0
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	7.7	7.3	6.6
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	7.9	7.9	7.3

LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	8.0	7.4	7.6
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	8.3	8.4	8.0
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	9.0	9.9	7.9
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	9.1	9.8	7.9
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	4.6	4.0	0.0
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	6.4	6.6	6.0
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	7.6	7.8	5.5
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	8.0	8.8	7.4
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	8.4	8.0	8.4
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	12.4	11.3	10.8
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	10.0	10.0	6.8
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	0.0	0.0	10.3
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	9.2	9.4	8.4
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	Caudal Vertebra	10.9	11.3	10.1
EARLY ROMAN	150 – 175	*Cyprinus carpio* Linnaeus, 1758	Common carp	Cervical Vertebra	17.2	17.8	14.5
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	Cervical Vertebra	11.8	12.4	10.2
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Ceratohyal	22.6	15.0	0.0
EARLY ROMAN	150 – 175	*Cyprinus carpio* Linnaeus, 1758	Common carp	Dentary	30.7	0.0	0.0
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Dentary	33.5	22.3	28.6
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	First vertebra	8.5	8.4	8.2
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	First vertebra	4.4	4.8	4.1
POST-MEDIEVAL	1750 – 1850	*Cyprinus carpio* Linnaeus, 1758	Common carp	First vertebra	11.8	0.0	0.0
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Hyomandibular	0.0	8.7	0.0
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Hyomandibular	7.8	0.0	0.0
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Hyomandibular	7.9	7.8	0.0
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Pharyngeal bone + teeth	16.8	12.4	0.0
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Preopercular	30.2	34.4	0.0
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Preopercular	30.4	36.2	0.0
LATE ROMAN	250 – 450	*Cyprinus carpio* Linnaeus, 1758	Common carp	Urostyle	8.1	8.3	0.0
EARLY BYZANTINE	450 – 600	*Cyprinus carpio* Linnaeus, 1758	Common carp	Pharyngeal bone + teeth	18.2	11.5	0.0

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Carassius carassius* (Linnaeus, 1758)	Crucian carp	Abdominal Vertebra	4.8	6.2	4.7
SLAV	800 – 1000	*Carassius carassius* (Linnaeus, 1758)	Crucian carp	Cervical Vertebra	3.8	3.7	3.4

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
LATE ROMAN	250 – 450	*Alburnus alburnus* (Linnaeus, 1758)	Bleak	Abdominal Vertebra	1.8	2.6	2.0

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
EARLY BYZANTINE	450 – 600	*Aspius aspius* (Linnaeus, 1758)	Asp	First vertebra	9.1	8.4	0.0
POST-MEDIEVAL	1750 – 1850	*Aspius aspius* (Linnaeus, 1758)	Asp	Caudal Vertebra	10.9	11.6	8.4

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
MID ROMAN	175 – 250	*Barbus barbus* (Linnaeus, 1758)	Barbel	Pharyngeal bone + teeth	15.4	10.1	0.0

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
LATE ROMAN	250 – 450	*Leuciscus cephalus* (Linnaeus, 1758)	Chub	Suprapharyngeal	39.3	30.1	0.0
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Leuciscus cephalus* (Linnaeus, 1758)	Chub	First vertebra	8.3	7.2	0.0
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Leuciscus cephalus* (Linnaeus, 1758)	Chub	Caudal Vertebra	6.4	7.3	6.6

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
EARLY BYZANTINE	450 – 600	*Rutilus rutilus mariza* Drensky, 1926	Roach	Dorsal fin spine	0.0	19.8	0.0
EARLY ROMAN	150 – 175	*Rutilus rutilus mariza* Drensky, 1926	Roach	Pharyngeal bone + teeth	18.8	14.5	0.0
MID ROMAN	175 – 250	*Rutilus rutilus mariza* Drensky, 1926	Roach	First vertebra	5.2	5.3	2.4

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	0.0	28.4	9.8
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	12.4	13.0	6.3
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	18.6	17.5	11.5
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	19.9	18.2	11.4
EARLY BYZANTINE	450 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	10.1	10.5	7.6
EARLY BYZANTINE	450 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	17.4	18.4	10.5
EARLY BYZANTINE	450 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	18.8	18.2	0.0
EARLY BYZANTINE	450 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	27.6	25.6	17.8
POST-MEDIEVAL	1750 – 1850	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	8.4	9.2	4.9
POST-MEDIEVAL	1750 – 1850	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	17.0	17.2	7.0
POST-MEDIEVAL	1750 – 1850	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	17.2	18.1	9.0
POST-MEDIEVAL	1750 – 1850	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	18.4	19.3	8.1
POST-MEDIEVAL	1750 – 1850	*Siluris glanis* Linnaeus, 1758	Wels catfish	Abdominal Vertebra	24.5	24.9	10.3
LATE ROMAN	250 – 450	*Siluris glanis* Linnaeus, 1758	Wels catfish	Caudal Vertebra	13.6	13.1	0.0
LATE ROMAN	250 – 450	*Siluris glanis* Linnaeus, 1758	Wels catfish	Caudal Vertebra	16.2	17.8	14.0
LATE ROMAN	250 – 450	*Siluris glanis* Linnaeus, 1758	Wels catfish	Caudal Vertebra	16.6	20.2	12.6
EARLY BYZANTINE	450 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Caudal Vertebra	6.9	7.2	0.0
EARLY BYZANTINE	450 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Caudal Vertebra	11.8	11.7	8.5
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Caudal Vertebra	18.4	16.9	12.0

LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Caudal Vertebra	18.7	16.6	12.6
POST-MEDIEVAL	1750 – 1850	*Siluris glanis* Linnaeus, 1758	Wels catfish	Caudal Vertebra	9.1	9.8	0.0
POST-MEDIEVAL	1750 – 1850	*Siluris glanis* Linnaeus, 1758	Wels catfish	Caudal Vertebra	17.8	16.6	12.0
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Centrum	18.8	19.1	0.0
EARLY BYZANTINE	450 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Centrum	18.1	19.3	5.1
LATE ROMAN	250 – 450	*Siluris glanis* Linnaeus, 1758	Wels catfish	Cervical Vertebra	14.3	15.6	0.0
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Cervical Vertebra	0.0	28.8	11.2
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Cervical Vertebra	12.5	13.9	6.1
LATE ROMAN – EARLY BYZANTINE	250 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Cervical Vertebra	13.8	15.0	6.9
LATE ROMAN	250 – 450	*Siluris glanis* Linnaeus, 1758	Wels catfish	Fin spine	0.0	32.8	0.0
LATE ROMAN	250 – 450	*Siluris glanis* Linnaeus, 1758	Wels catfish	Fin spine	26.7	9.4	0.0
LATE ROMAN	250 – 450	*Siluris glanis* Linnaeus, 1758	Wels catfish	Fin spine	88.3	23.9	0.0
LATE ROMAN	250 – 450.	*Siluris glanis* Linnaeus, 1758	Wels catfish	Fin spine	88.4	24.8	0.0
EARLY BYZANTINE	450 – 600	*Siluris glanis* Linnaeus, 1758	Wels catfish	Fin spine	9.6	0.0	0.0
POST-MEDIEVAL	1750 – 1850	*Siluris glanis* Linnaeus, 1758	Wels catfish	Fin spine	68.9	20.1	0.0
POST-MEDIEVAL	1750 – 1850	*Siluris glanis* Linnaeus, 1758	Wels catfish	Fin spine	70.6	23.2	0.0
LATE ROMAN	250 – 450	*Siluris glanis* Linnaeus, 1758	Wels catfish	Hypobranchial	49.2	49.8	0.0

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
EARLY BYZANTINE	450 - 600	Pleuronectidae	Flatfish family	Caudal Vertebra	7.0	7.1	5.0

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
EARLY BYZANTINE	450 - 600	*Platichthys flesus* (Pallas, 1811)	Flounder	Caudal Vertebra	7.0	7.0	4.6

PERIOD	DATE	TAXA	COMMON NAME	ELEMENT	MEAS1	MEAS2	MEAS3
LATE ROMAN - EARLY BYZANTINE	250 - 600	*Scomber scombrus* Linnaeus, 1758	Mackerel	Caudal Vertebra	5.9	6.0	9.1
LATE ROMAN - EARLY BYZANTINE	250 - 600	*Scomber scombrus* Linnaeus, 1758	Mackerel	Caudal Vertebra	6.1	6.1	9.8
POST-MEDIEVAL	1750 - 1850	*Scomber scombrus* Linnaeus, 1758	Mackerel	Caudal Vertebra	4.9	4.2	7.9

13

THE BIRD BONES

by

Zlatozar Boev and Mark J. Beech

Introduction

Until recently, bird bone remains recovered from archaeological excavations in Bulgaria have not received the attention they deserve. Publications by Ivanov (1956, 1959) represent the first attempts to study the evidence for domestic birds from archaeological excavations. Moreover, the full publication of bird bones from archaeological sites in Bulgaria has only begun a few years ago (Boev 1986a, b, 1988, 1991a,b,c, 1993a,b, 1996a,b; Boev and Iliev 1989,1991, Boev and Ribarov 1989, 1990, 1993, Iliev *et al* 1992, 1993, Ribarov and Boev 1990). Consequently, very little is known about birds and their relative importance to the local economy in the Roman period. A preliminary survey of the bird bones from the excavations at Nicopolis has already been published (Boev 1991c), but this was written before the full analysis of the results had been completed and a dated stratigraphic sequence established. The following final report includes a comparison of the Nicopolis material with what is known from other Bulgarian sites dating to broadly to the same period.

Material and Methods

Bird bones were recovered by hand retrieval, on-site dry sieving (using *c* 5mm mesh), and by wet-sieving of bulk samples to 500 microns. The majority of the bird remains were identified by comparing them with the osteological collection of birds in the Department of Zoology in the National Museum of Natural History, Sofia. The remainder were identified by consulting the reference collections in the Palaeontological Institute of the Russian Academy of Sciences in Moscow. The first author made all the identifications and was responsible for the quantification of the assemblage which used conventional fragment counts (NISP values). An attempt was made to identify all fragments and, so as to reduce the likelihood of counting the same bone twice the material from each context was checked for conjoining pieces. The second author assisted with the phasing and sorting of the material into chronological periods, was responsible for the first editing of the manuscript as well as writing the final section which compares the Nicopolis assemblage with data from other archaeological sites in the region.

Results and Discussion: Species Composition

A total of 1,997 bird bones were recovered from the excavations, of which 1,675 were identifiable to the level of species (Table 13. 1). The majority belonged to domestic species, in particular, domestic fowl (*Gallus gallus domestica*) and goose (*Anser anser domestica*) and only 16% belonged to wild birds (Fig 13.1). A peacock (*Pavo cristatus*) was also identified and was presumably kept for its decorative appearance, rather than being reared for food. Of the wild species, partridge and quail were the most common birds found on the site.

A total of 55 bird taxa were identified, of which 42 could be identified to species level. Eleven orders of the modern Bulgarian avifauna were present; Podicipediformes, Pelecaniformes, Anseriformes, Falconiformes, Galliformes, Charadriiformes, Gruiformes, Strigiformes, Columbiformes, Caprimulgiformes and Passeriformes.

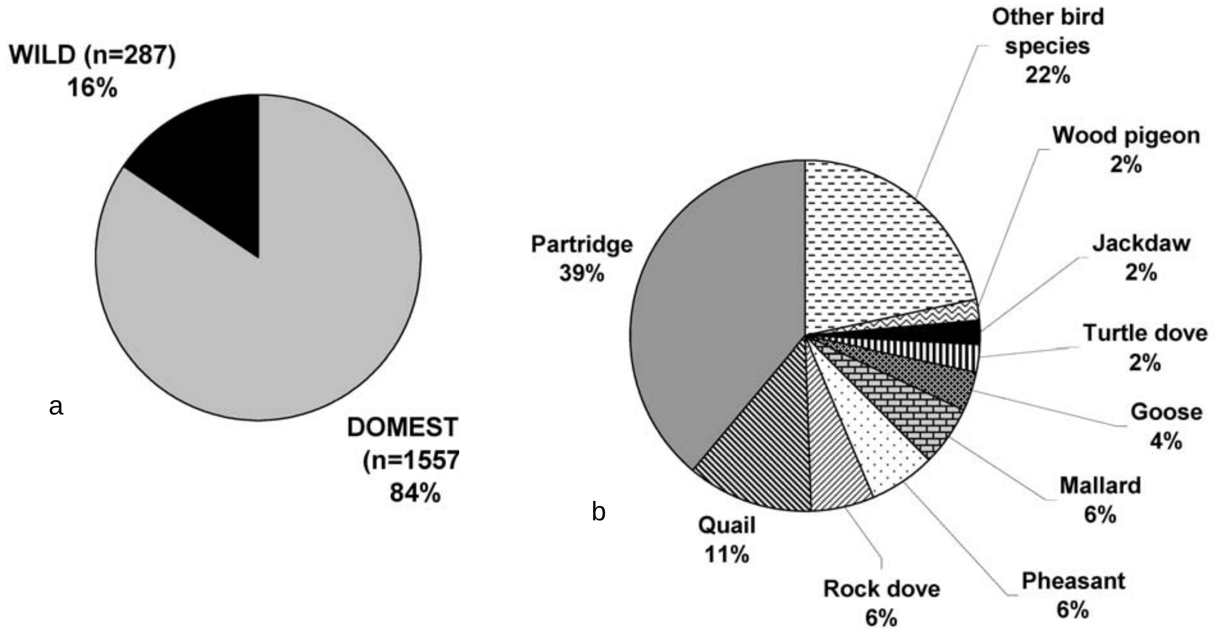


Fig 13.1 (a) Relative NISP percentages of domestic vs. wild birds at Nicopolis. (b) Relative NISP percentage of wild birds at Nicopolis (n=287)

Six types of birds can be distinguished according to their ecological classification, that is their natural habitat (Harrison 1975). These comprise; domestic species (4%), open country species (17%), petrophyllous species (13%), synanthropic species (13%), water species (28%) and woodland species (25%) (Fig 13.2).

The species composition established for Nicopolis represents 14% of the modern avifauna found in Bulgaria. Several of the species recorded are 'synanthropic,' that is bird species which today live in urban environments. These include the rock/feral pigeon (*Columbia livia*/*Columba livia domestica*), little owl (*Athene noctua*), tawny owl (*Strix aluco*), house sparrow (*Passer domesticus*), chaffinch (*Fringilla coelebs*), starling (*Sturnus vulgaris*), magpie (*Pica pica*), carrion crow (*Corvus corone*), and jackdaw (*Corvus monedula*).

Although, in most periods, domestic fowl dominated the assemblages, it is notable that it was during the first occupation period (100–175) that the situation was reversed and over 70% of the finds were from wild species (Fig 13.3). At this time, the most common wild species represented in the finds was partridge (*Perdix perdix*), followed by quail (*Coturnix coturnix*). The ratio of domestic to wild species, according to the number of identified fragments, appears to have remained fairly constant in all later periods. The range of wild birds exploited during the Late Roman and early Byzantine periods appears markedly greater between 250 and 600, although this may appear so simply because the majority of all deposits excavated belong to the late Roman and early Byzantine periods (above, pp. 4–5, Poulter 1999, 28–29). Inevitably, the larger the assemblage, the greater the range of species identified.

The natural environment around the city

Birds from water and woodland habitats dominate the assemblage, accounting for 53% of all species represented (Fig 13.2 and Table 13. 2). There must have been extensive areas of shallow water in the vicinity, such as swamps, lakes or wide, marshy river floodplains. It also follows that, unlike today when deforestation has substantially modified the landscape, the river valleys of the Rositsa, Yantra, Bohot, Negovanka, and Lefedja still contained extensive tracts of woodland in Antiquity (Fig 1.6). The numerous meanders and the marshland within the river valleys would have provided an excellent habitat for a variety of avifauna, a rich resource which must have been exploited for the wide range of wildfowl it would have provided. Species recorded include the great crested grebe (*Podiceps cristatus*),

Table 13.1 Quantification of the bird bones by period (NISP values)

TAXON	100–175	175–250	250–450	450–600	800–1000	1750–1850	TOTAL
Great crested grebe, *Podiceps cristatus* (Linnaeus, 1758)	-	-	1	-	-	-	**1**
Cormorant, *Phalacrocorax carbo* (Linnaeus, 1758)	-	-	-	-	-	1	**1**
Pelican, *Pelecanus* sp.	-	-	1	-	-	-	**1**
Mute swan, *Cygnus olor* (Gmelin, 1789)	-	-	-	-	-	1	**1**
Greylag goose, *Anser anser* (A.a.dom) (Linnaeus, 1758)	-	1	30	16	-	11	**58**
Bean goose, *Anser fabalis* (Latham, 1787)	-	-	-	3	-	-	**3**
White fronted goose, *Anser alibifrons* (Scopoli, 1769)	-	-	1	-	-	2	**3**
Goose, *Anser* sp.	1	-	7	2	-	1	**11**
Shelduck, *Tadorna tadorna* (Linnaeus, 1758)	-	-	-	-	-	1	**1**
Mallard, *Anas platyrhynchos* (Linnaeus, 1758)	-	1	4	8	-	5	**18**
Wigeon, Anas *penelope* (Linnaeus, 1758)	-	-	-	1	-	-	**1**
Teal, *Anas crecca* (Linnaeus, 1758)	-	-	1	1	-	1	**3**
Garganey, *Anas querquedula* (Linnaeus, 1758)	-	-	-	-	-	1	**1**
Duck, *Anas* sp.	-	-	1	-	-	-	**1**
Pochard, *Aythya farina* (Linnaeus, 1758)	-	-	1	-	-	1	**2**
Anatinae	-	-	-	-	-	1	**1**
Sparrowhawk, *Accipiter nisus* (Linnaeus, 1758)	-	-	1	-	-	-	**1**
Goshawk, *Accipiter gentilis* (Linnaeus, 1758)	-	-	1	1	-	1	**3**
Lammergeier, *Gypaetus barbatus* (Linnaeus, 1758)	-	-	-	-	-	1	**1**
Buzzard, *Buteo buteo* (Linnaeus, 1758)	-	-	-	1	-	-	**1**
Hawks, Accipitridae gen.	-	-	-	-	-	1	**1**
Kestrel, *Falco tinnunculus* (Linnaeus, 1758)	-	-	-	-	-	2	**2**
Falconiformes fam.	-	-	1	1	-	-	**2**
Partridge, *Perdix perdix* (Linnaeus, 1758)	80	1	13	7	-	6	**107**
Peacock, Pavo cristatus (Linnaeus, 1758)	-	-	-	1	-	-	**1**
Rock partridge, *Alectoris graeca* (Meisner, 1804)	-	-	1	-	-	1	**2**
Perdix/Alectoris	5	1	1	-	-	-	**7**
Quail, *Coturnix coturnix* (Linnaeus, 1758)	27	-	5	-	-	1	**33**
Pheasant, *Phasianus colchicus* (Linnaeus, 1758)	1	2	2	11	-	4	**20**
Domestic fowl, *Gallus gallus* dom. (Linnaeus, 1758)	24	76	657	359	3	224	**1343**
Domestic fowl/Pheasant, *Gallus/Phasianus*	21	10	61	44	-	23	**159**
Galliformes fam.	1	-	-	-	-	-	**1**
Great bustard, *Otis tarda* (Linnaeus, 1758)	-	-	1	-	-	1	**2**

Continued over the page

TAXON	100–175	175–250	250–450	450–600	800–1000	1750–1850	TOTAL
Little bustard, *Otis tetrax* (Linnaeus, 1758)	-	-	-	-	-	1	**1**
Gull, *Larus* sp.	-	-	1	-	-	-	**1**
Charadriiformes fam.	-	-	-	-	-	1	**1**
Rock dove, *Columbia livia* Gmelin, 1789	-	-	14	3	-	1	**18**
Stock dove, *Columba oenas* (Linnaeus, 1758)	-	-	2	1	-	-	**3**
Wood pigeon, *Columba palumbus* (Linnaeus, 1758)	-	-	3	2	-	2	**7**
Turtle dove, *Streptotelia turtur* (Linnaeus, 1758)	-	1	2	3	-	1	**7**
Little owl, *Athene noctua* (Scopoli, 1769)	-	-	1	-	-	1	**2**
Tawny owl, *Strix aluco* (Linnaeus, 1758)	-	-	1	-	-	-	**1**
Nightjar, *Caprimulgus europaeus* (Linnaeus, 1758)	-	-	-	1	-	-	**1**
Thrush, *Turdus* sp.	-	-	-	-	-	1	**1**
House sparrow, *Passer domesticus* (Linnaeus, 1758)	1	-	-	2	-	-	**3**
Sparrow/Finch, *Passer/Fringilla*	-	-	1	-	-	-	**1**
Chaffinch, *Fringilla coelebs* (Linnaeus, 1758)	-	-	-	2	-	1	**3**
?Linnet, *Acanthis* cf. *cannabina* (Linnaeus, 1758)	-	-	1	-	-	-	**1**
Starling, *Sturnus vulgaris* (Linnaeus, 1758)	-	-	1	-	-	-	**1**
Nutcracker, *Nucifraga caryocatactes* (Linnaeus, 1758)	-	-	-	-	-	1	**1**
Magpie, *Pica pica* (Linnaeus, 1758)	-	-	3	-	-	-	**3**
Alpine chough, *Pyrrhocorax graculus* (Linnaeus, 1766)	-	-	-	-	-	1	**1**
Rook, *Corvus frugilegus* (Linnaeus, 1758)	-	-	3	1	-	-	**4**
Carrion crow, *Corvus corone* Linnaeus, 1758	-	1	2	-	-	-	**3**
Jackdaw, *Corvus monedula* (Linnaeus, 1758)	-	-	5	1	-	-	**6**
Aves indet.	7	6	33	55	1	12	**114**
TOTAL	**168**	**100**	**867**	**519**	**4**	**306**	**1995**

pelicans (*Pelecanus sp.*), cormorants (*Phalacrocorax carbo*) and a number of geese, ducks and diving ducks. These species could not have been hunted unless extensive tracts of open water existed in the region. Of particular interest is the appearance of the crested grebe. The great crested grebe does not normally leave open water and its nests are built in marshes or in lakes on rafts of driftwood and decaying plants, far from dry land. Its appearance suggests that fowling was practiced, probably from boats, using lassos, nets or dogs to hunt game. Mute swans are usually found on open expanses of water, up to two metres deep, where, in shallow stretches near the margins, they could reach down to the riverbed for food. Gulls suggest that there were open stretches of sandy beach close to Nicopolis. They no doubt supplemented their diet by feeding on rubbish dumps outside the city.

The discovery of birds commonly found in woodland habitats points to the existence close by of old deciduous mixed woodland. The preferred habitat of the pheasant (*Phasianus colchicus*) is woodland on floodplains which occur on the lower reaches of large rivers. The goshawk (*Accipter gentilis*) and the sparrow hawk (*Accipter nisus*) hunt their prey in woodland clearings or in open country, where bush and tree cover is limited. The wood pigeon (*Columba palumbus*), the stock dove (*Columba

Table 13.2 Habitats of birds present at Nicopolis

Habitat descriptions after Heinzel *et al* 1979.

TAXON	HABITAT
Great crested grebe, *Podiceps cristatus* (Linnaeus, 1758)	Breeds on lakes, gravel pits, reservoirs and slow moving rivers. Winters on estuaries, lakes and reservoirs.
Cormorant, *Phalacrocorax carbo* (Linnaeus, 1758)	Inshore waters on all types of coast, also on lakes inland.
Pelican, *Pelecanus* sp.	Fresh and brackish lakes and marshes, shallow coastal water.
Mute swan, *Cygnus olor* (Gmelin, 1789)	Still and slow-moving freshwater, estuaries, sheltered coastal water, sometimes breeding in swamps.
Greylag goose, *Anser anser* (A.a.dom) (Linnaeus, 1758)	Breeds in lowland moors and marshes. The farmyard goose (A.a.dom.) is its domestic derivative.
Bean goose, *Anser fabalis* (Latham, 1787)	Breeds in marshy places and by freshwater on tundra and in taiga.
White fronted goose, *Anser alibifrons* (Scopoli, 1769)	Breeds on marshy tundra.
Shelduck, *Tadorna tadorna* (Linnaeus, 1758)	By brackish or more rarely freshwater lakes and inland seas.
Mallard, *Anas platyrhynchos* (Linnaeus, 1758)	Breeds not far from all kinds of still and slow-moving water and marshes. In winter also estuaries and seashores.
Wigeon, Anas *penelope* (Linnaeus, 1758)	Breeds by freshwater on moors and tundra, rarely in coastal marshes. In winter on lakes, reservoirs, estuaries and shallow coastal waters, flocks often grazing on fields.
Teal, *Anas crecca* (Linnaeus, 1758)	Breeds on still and slow moving freshwater with dense fringes of vegetation, also marshes, fens and bogs. In winter on lakes, reservoirs, estuaries and coastal water.
Garganey, *Anas querquedula* (Linnaeus, 1758)	As for teal.
Pochard, *Aythya ferina* (Linnaeus, 1758)	Still and slow-moving freshwater with vegetated margins. In winter also on reservoirs and other bare-banked waters. Breeds also on brackish lakes.
Sparrowhawk, *Accipiter nisus* (Linnaeus, 1758)	Wooded country, sometimes penetrating villages and town suburbs.
Goshawk, *Accipiter gentilis* (Linnaeus, 1758)	Forests, both coniferous and broad-leaved.
Lammergeier, *Gypaetus barbatus* (Linnaeus, 1758)	High and usually remote mountains, nesting on rock ledges.
Buzzard, *Buteo buteo* (Linnaeus, 1758)	Forests and areas with scattered woods. In winter in more open country.
Hawks, Accipitridae gen.	Nest in trees. Specialists in catching smaller birds in woodland and scrub.
Kestrel, *Falco tinnunculus* (Linnaeus, 1758)	Open country, with crags or scattered trees, sea cliffs, towns and villages. Nest on rock-ledge, building or tree.
Partridge, *Perdix perdix* (Linnaeus, 1758)	Open country, including farmland, especially arable, moorland, steppes, and semi-deserts.
Peacock, Pavo cristatus (Linnaeus, 1758)	The peacock is an ornamental bird originating in India. It is found widely in the Indian sub-continent from the south and east of the Indus river, Jammu and Kashmir, east Assam, south Mizoram and the whole of the Indian peninsula.
Rock partridge, *Alectoris graeca* (Meisner, 1804)	Rocky, stony and thinly grassy hill and mountain slopes. Also found in vineyards.
Quail, *Coturnix coturnix* (Linnaeus, 1758)	Farmland, especially among growing crops, open grassland, steppes, and semi-deserts.
Pheasant, *Phasianus colchicus* (Linnaeus, 1758)	Open country with scattered woods, copses or riverine belts of trees or shrubs, marshes, extensive reed-beds, often feeding on cultivated land.
Domestic fowl, *Gallus gallus* dom. (Linnaeus, 1758)	In villages and towns.
Great bustard, *Otis tarda* (Linnaeus, 1758)	Treeless plains, steppes and extensive cultivations.
Little bustard, *Otis tetrax* (Linnaeus, 1758)	Grassy and cultivated plains, sometimes with scattered trees and bushes.
Gull, *Larus* sp.	Nesting grounds on cliffs or flat ground by the sea, also inland by freshwater.
Charadriiformes fam.	Various including fresh and brackish water, sand and mud flats.

Continued over the page

TAXON	HABITAT
Rock dove, *Columba livia* Gmelin, 1789	On cliffs and rocks. On mountains and hillsides where it nests in rock crevices or caves. A feral pigeon in towns, also on inland and sea cliffs.
Stock dove, *Columba oenas* (Linnaeus, 1758)	Woodland and country with scattered trees, also on cliffs and sometimes in towns.
Wood pigeon, *Columba palumbus* (Linnaeus, 1758)	Wooded country, feeding both in trees and on adjacent farmland.
Turtle dove, *Streptotelia turtur* (Linnaeus, 1758)	Wide range of country with open woodland or scattered trees, often feeding in farmland.
Little owl, *Athene noctua* (Scopoli, 1769)	Farmland and open country with scattered trees, open woodlands, and orchards.
Tawny owl, *Strix aluco* (Linnaeus, 1758)	Open, mainly deciduous woodland, parkland, large gardens and other areas with scattered trees, not uncommon in villages, towns and some cities.
Nightjar, *Caprimulgus europaeus* (Linnaeus, 1758)	Open woodlands, forest edges, patches of felled woodland, and open country with scattered trees.
Thrush, *Turdus sp*.	Nest usually in bush or tree.
House sparrow, *Passer domesticus* (Linnaeus, 1758)	Highly gregarious, inhabiting human settlements of all kinds including large urban centres, often feeding in associated cultivated areas.
Chaffinch, *Fringilla coelebs* (Linnaeus, 1758)	Woods and forests, areas with scattered trees, heaths, farmlands, town parks, gardens; frequent in town suburbs.
?Linnet, *Acanthis* cf. *cannabina* (Linnaeus, 1758)	Open bushy country including mixed farmland, where both arable and grassland habitats are present.
Starling, *Sturnus vulgaris* (Linnaeus, 1758)	Open woods, areas with scattered trees, cultivations, villages and towns.
Nutcracker, *Nucifraga caryocatactes* (Linnaeus, 1758)	Forests, especially coniferous; frequently perches on topmost branches of trees, and hops on the ground.
Magpie, *Pica pica* (Linnaeus, 1758)	Areas with scattered trees and scrub, from tundra and semi-desert to farmland and town suburbs.
Alpine chough, *Pyrrhocorax graculus* (Linnaeus, 1766)	High rocky mountains with steep cliffs and crags.
Rook, *Corvus frugilegus* (Linnaeus, 1758)	Farmlands and grasslands with plenty of scattered trees or small woods, feeding in more open country.
Carrion crow, *Corvus corone* (Linnaeus, 1758)	Frequent in farmland, moorland, town parks and suburbs.
Jackdaw, *Corvus monedula* (Linnaeus, 1758)	Open and cultivated country with rocks, crags and old trees, frequent in towns and villages, especially around ruins.

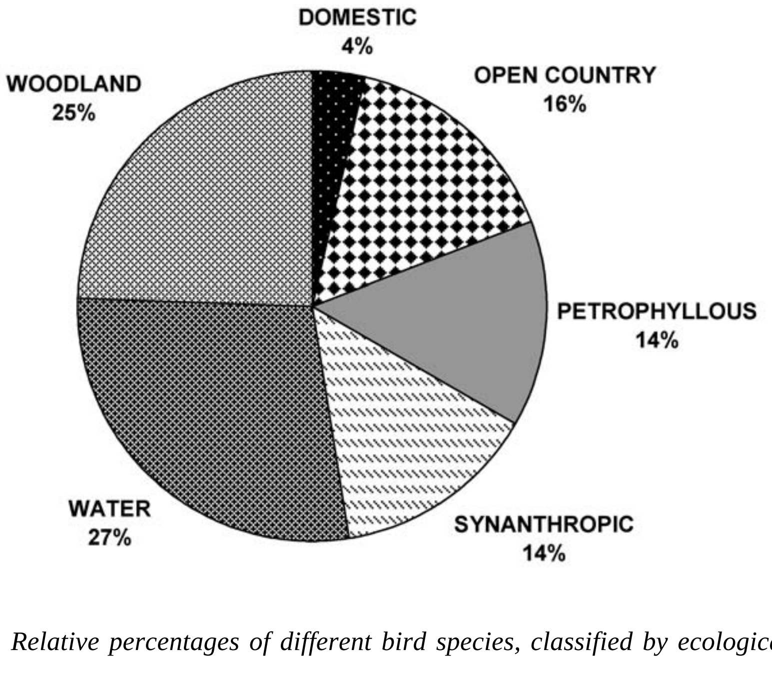


Fig 13.2 Relative percentages of different bird species, classified by ecological type

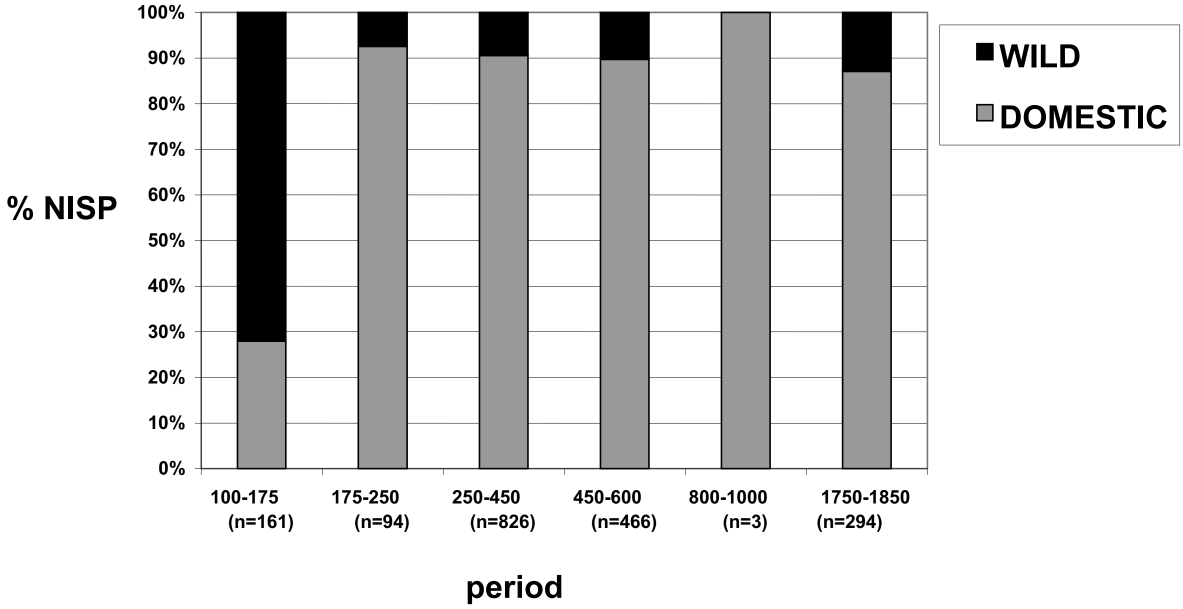


Fig 13.3 Proportions of domestic vs. wild birds, quantified by NISP and by period

oenas), perhaps the tawny owl (*Strix aluco*) and the buzzard (*Buteo buteo*) are usually to be found in woodland, nesting in the tops of large old trees. The magpie (*Pica pica*) prefers a generally open landscape with occasional trees or lives in clumps of high shrubs in open pastures or fields. The nutcracker (*Nucifraga caryocatactes*) lives in coniferous and mixed (predominantly beech) woodland and only during very cold winters comes down to the lowland plains and valleys. The nightjar (*Caprimulgus europaeus*) prefers coniferous, broad leaf and mixed woodlands, whereas the thrush (genus *Turdus*) is found in forest or shrubland. As the bird finds include nine species which prefer open landscapes, it also seems certain that in Antiquity, close to the city, there was unforested land, probably open fields. There would have also have been pastures, meadows or open arable land. These habitats would have been ideal for the great bustard (*Otis tarda*), little bustard (*Otis tetrax*), partridge (*Perdix perdix*), quail (*Coturnix coturnix*) and rook (*Corvus frugilegus*), all of whom would have favoured these open areas to nest, feed and rear their young.

The petrophyllous species, which include the lammergeier (*Gypaetus barbatus*), jackdaw (*Corvus monedula*), kestrel (*Falco tinnunculus*) and little owl (*Athene noctua*), dwell in rock massifs where they nest on high, inaccessible precipices and entrances to caves or rock crevices. Usually, the species migrates in search of food to overwinter in the lowlands and plains. The rock partridge (*Alectoris graeca*) is also a petrophyllous species. It prefers stony terrain, screes, erosion sections and rocky areas within grasslands. Such habitats still exist in the region today. Since 1961 the lammergeier (*Gypaetus barbatus*) has disappeared from Bulgaria, and all data concerning its former distribution is therefore of considerable interest. According to Kuzev (1927), the lammergeier nested on rocks in the Eleno-Tvardishka mountains until the first quarter of this century. As it is difficult to distinguish between the bones of wild rock dove (*Columba livia*) and feral pigeon (*C. livia domestica*), bones identified as belonging to one or other of these species are classified together, the majority of finds probably belonging to rock doves.

DOMESTIC FOWL

Two types of domestic birds were identified in the Nicopolis assemblage. Although this only amounts to about 5% of the species represented, at least 84% of the bird bone fragments were from domestic birds. The remains of domestic fowl (*Gallus gallus domestica*) are the most numerous, represented by 1,343 bones, followed by those of domestic goose (*Anser anser domestica*), totalling 58 bones. Besides those bones determined to Gallus, most of the bone fragments classified as 'Gallus/Phasianus'

were probably also Gallus, because the ratio of both species (domestic fowl and pheasant) in the material which could be differentiated was 1343:20, or approximately 67:1. It follows that many of the bones classified as 'Gallus/Phasianus' are most likely to have been domestic fowl.

The occasional breeding of feral pigeon or domestic duck (*Anas platyrhynchos domestica*) may have taken place, but the limited material collected is insufficient to decide whether they were wild or not. However, the relatively small amounts of bones from rock dove and mallard does suggest that these species were not reared in captivity.

It is clear that poultry breeding, rather than wildfowl hunting, made the most important contribution towards the citizens' diet.

Breed and Sexual Composition of the Domestic Fowl

Sexing of *Gallus gallus domesticus* was determined solely by the tarsometatarsus and the development on the bony base of the corneous spur on its mediocaudal surface in the case of roosters (this distinguishing feature is only present in mature males). It is relatively easy to identify different breeds by comparing their metrical differences. Analysis indicated the presence of at least two breeds of domestic fowl. One was large and was about the same size as present day meat breeds. The other was small and gracile, suggesting that it was bred for decorative or sporting purposes. The osteometric characteristics of this breed will be subject to further specialist research. It is also possible that a third breed of domestic fowl existed. Numerous bones of a medium sized specimen were recovered, quite distinct from the bones of the other two breeds. The ratio of the large and medium to small is 1312:31, ie, 42:1. The ratio between male and females is 39:47 (Table 13. 3). This indicates an unusually large number of roosters compared to hens. The sex ratio is approximately 1 cock: 1.2 hens. This suggests that males were not selectively culled; males were reared with females until attaining sexual maturity. The fact that the numbers of roosters and hens were overall quite similar provides no grounds for believing that any of the breeds of domestic fowl were treated in a different way.

The preliminary results of Boev (1991c) are analogous. It is interesting to note that the small domestic fowl (bantam fowl size), appear in the city at the same time as the larger and medium sized breeds, in the period 175–250. Two very large roosters, one dated 250–450, the other 450–600, and two large hens from contexts dated 250–450 were also found. The bony base of one cock's spur, dated 250–450, was no less than 26.5mm in length, probably because it belonged to a fighting breed.

Long bones of the lower limb, the tibiotarsus, tarsometatarsus and femur, are the best represented in the bird bone material (Table 13. 3). These three types of bones amount to 36% of all the bones identified as domestic fowl. Examination of the material for fragmentation of the bones indicates that vertebrae and phalanges are best preserved (without breakage), followed by the coracoid, tarsometatarsus and carpometacarpus. Around 63% of all of these bone types were preserved intact.

WILDFOWL

The species composition of wildfowl was rich and varied. The inhabitants of the city hunted at least 33 species, which today are considered as wildfowl. Four orders of wildfowl were represented; waterfowl (*Anseriformes*), gamefowl (*Galliformes*), Gruiformes and Columbiformes. Waterfowl were the most abundant species.

The discovery of pheasant, a species which has not previously been considered as a native species in the Balkans, is of great interest. It indicates that, if the species had been brought into Europe, it was already established there by the 2nd century. Recently, pheasant bones have also been identified from the Eneolithic site near Dolnoslav in central southern Bulgaria, dating to *c* 6000 B.P. (Boev 1996a).

Grey partridges and quails were the most common species of wild fowl. Both species are mainly attested during the earliest period of occupation, *c* 100–175. If it is accepted that the mute swan (*Cygnus olor*) was a game bird (a single find from the post-medieval period), then the great bustard and mute swan were the largest game birds identified in the bone material. The great bustard is also found in the Roman to late Roman period (250–450). As nesting species, both European bustards have

Table 13.3 Anatomical representation of the domestic chicken (Gallus gallus domesticus) (NISP values)

Anatomical unit	**Small size**	**Small size**	**Large to medium size**	**Large to medium size**	**TOTAL**
	juvenile	**adult**	**juvenile**	**adult**	
Tibiotarsus	-	3	19	165	187
Tarsometatarsus (total)	1	5	25	124	155
Tarsometatarsus (male)		*(1)*		*(38)*	*(39)*
Tarsometatarsus (female)		*(2)*		*(45)*	*(47)*
Tarsometatarsus (unsexed)	*(1)*	*(2)*	*(25)*	*(41)*	*(69)*
Femur	-	1	18	116	135
Radius	-	1	4	121	126
Coracoid	-	1	9	103	113
Humerus	-	9	17	81	107
Ulna	-	4	10	80	94
Scapula	-	-	3	83	86
Sternum	-	1	-	75	76
Synsacrum	-	-	2	59	61
Phalanges dig. pedis	-	-	1	49	50
Furcula	-	1	1	46	48
Carpometacarpus	2	-	-	39	41
Vertebrae	-	-	-	17	17
Costae	-	-	-	14	14
Fibula	-	-	1	12	13
Phalanx 1 dig. III allae	-	-	-	8	8
Synsacrum (corpora verteb.)	-	1	-	5	6
Mandibula	-	-	-	3	3
Notarium	-	-	-	1	1
Cranium	-	1	-	-	1
Pygostyl	-	-	-	1	1
TOTAL	**3**	**28**	**110**	**1202**	**1343**

now disappeared from the Bulgarian avifauna. The sole specimen of little bustard identified comes from a post-medieval context.

The most diverse range of wildfowl game is found in the Roman to late Roman period (250–450), when at least ten species were hunted: the great crested grebe, geese (type unknown), white-fronted goose, shelduck, (?)mallard, wigeon, teal, garganey, wood pigeon, stock dove, (?)rock dove, rock partridge, pheasant, pochard and turtle dove. It was at this time that the city was most threatened by external enemies, first the Goths and then the Huns. It may be that the population of Nicopolis became more dependant upon hunting wildfowl and the breeding of poultry during these difficult years. Certainly, the numbers of domestic fowl bones recorded for this period are many more than during other periods which suggests that the citizens depended heavily upon chickens as a source of food.

ORNAMENTAL BIRDS

According to Sossinka (1982), the Indian (Blue) peacock (*Pavo cristatus*) was one of the first birds to be domesticated, along with the greylag goose (*Anser anser*), the rock dove (*Columba livia*), the red jungle fowl (*Gallus gallus*) and the mallard (*Anas platyrhynchos*). He maintains that these species ‘were bred with increasing success by the Greeks and, in particular, by the Romans, who developed a market for delicacies derived therefrom’ (Sossinka 1982, 377). Bogdanov (1937) also asserts that the peacock is a product of an ancient domestication, but notes that there is an important difference between the peacock and other domesticated birds. The peacock remained practically unchanged in morphological terms and appears to be identical with its ancestor, the wild Indian peacock.

The first reports of peacocks in Europe occurs in the Bible (1 Kings 10.22) where they are listed amongst the contents of the Phoenician ships of King Solomon (1020–980 BC). These spectacular birds are mentioned several times in the Bible, and they were brought to the town of Tharsis, between the rivers Guadiana and Guadalquivir in southern Spain. The first clear evidence for peacock breeding in Europe comes from Greece (Bogdanov 1937). They were brought there from Asia Minor, and, by the 5th century BC, peacocks were a common domestic bird in Athens. Peacocks were probably also reintroduced by Alexander the Great (330–323 BC). In the early 1st century AD the Romans took an interest in peacocks and began breeding them for their meat (Bogoljubskyi 1959). The Romans also offered peacocks as a sacrifice to Juno, the goddess of matrimony and motherhood.

The oldest archaeological find of peacock from Europe which has so far been found is a proximal fragment of a right tibiotarsus, which was discovered in a deposit described as being of simply 'Holocene' date from a site in Poland (Bochenski 1974). The discovery of the peacock bone from Nicopolis is therefore of some interest. The bone (NMNH Sofia, catalogue number 4295) came from an early Byzantine context (450–600) but is most probably residual. A date in the 2nd or 3rd centuries AD would seem most likely, given the prosperity of the city at that time. It consists of half of a pelvis (synsacrum). Comparison of its bony sculpture and general size with modern peacock bones in the Sofia National Museum of Natural History collections suggests that it came from an adult male. The remains of peacock (*Pavo cristatus*) have not been identified before on any archaeological site in Bulgaria. It provides tantalising evidence which suggests that peacocks may have been bred in the larger Roman towns in the region. Numerous Roman bas-reliefs include depictions of peacocks but this is the first direct zooarchaeological evidence for its existence. Although peacocks may have been kept in Nicopolis for their aesthetic/ornamental value, it is quite possible that the inhabitants considered the meat a delicacy.

Butchery and cooking practices

Knife-cuts to the distal articulations of both humerus and tibiotarsus indicate that the trunks of birds were cut open to remove the distal parts of the body (apical end of the wings and feet), removing non-meat bearing parts. Only a few bones have traces of burning, suggesting that the birds were normally cooked by boiling/baking, rather than by cooking directly over a fire.

BIRDS OF UNCERTAIN SIGNIFICANCE TO MAN

The remaining 23 species of wild birds, which cannot be generally considered as game, are included in this category. Some of them would today be regarded as synanthropic species: the rock/feral pigeon (*Columbia livia*/*Columba livia domestica*), little owl (*Athene noctua*), tawny owl (*Strix aluco*), house sparrow (*Passer domesticus*), chaffinch (*Fringilla coelebs*), starling (*Sturnus vulgaris*), magpie (*Pica pica*), carrion crow (*Corvus corone*), and jackdaw (*Corvus monedula*). All these species are classified by Donchev and Jankov (1989) as initial, advanced or extreme synurbanists for whom human activity does not deter them from living in towns and villages. However, it should be remembered that some passerine species, such as starlings, thrushes and warblers, are still regarded in some parts of Europe as a valuable source of food, notably in France, Italy and Greece.

Some of the species found at Nicopolis cannot be regarded as synurban avifauna; namely the cormorant (*Phalacrocorax carbo*), mute swan (*Cygnus olor*), sparrowhawk (*Accipiter nisus*), goshawk (*Accipiter gentilis*), buzzard (*Buteo buteo*), nightjar (*Caprimulgus europaeus*), kestrel (*Falco tinnunculus*) and, particularly, the lammergeier (*Gypaetus barbatus*). Some of these birds, like the sparrowhawk and goshawk, may have been used for falconry, hunting small game such as partridges, doves, quails, and hares. Both species of hawks are often used for hunting today (Sternberg 1969). As a large and beautiful bird with spectacular plumage, the lammergeier may have been considered a hunting trophy. Its primary feathers may have been used as stabilizers in hunting arrows, a practice which still existed in the region during the 18th century (Georgiev, 1987). The presence of nutcracker

(*Nucifraga caryocatactes*) and alpine chough (*Pyrrhocorax graculus*) may simply be chance occurrences. Both species are mountain birds and their closest 'typical' (breeding) habitats are more than 40 kilometres south of Nicopolis.

The Nicopolis bird bone assemblage: Comparison with other published sites

As mentioned earlier, there has been relatively little research carried out in Bulgaria on bird remains from archaeological sites. Boev (1991b) mentions, in a review of waterfowl found on fifteen archaeological sites of various dates, notes that they produced a modest total of only 257 bone fragments. Most of these sites only produced a very small number of bird bones, no doubt because no systematic recovery methodology had been employed during the excavations. Geese bones were the most common finds which suggests that the samples were biased in favour of the larger and better-preserved bones which could have been retrieved by hand. There are a few sites, contemporary with Nicopolis, which have produced fuller records and, generally, these assemblages are dominated by domestic fowl and include only very small quantities, usually just one or two bones, belonging to wild species.

The presence of domestic fowl, as well as fourteen bones of greylag/domestic geese (*Anser anser* cf, *domestica*), and other bones of goose (*Anser sp.*), gadwall (*Anas strepera*) and garganey (*Anas querquedula*) were noted in 2nd – 5th century levels at Cabyle in Central Bulgaria (Boev and Ribarov, 1993, Ribarov 1982).

A total of forty-nine bird bone fragments were recorded from 2nd-4th century levels at Ratiaria (Archar) on the Danube in north-west Bulgaria (Iliev *et al* 1993). The bone assemblage includes thirty five from domestic fowl (*Gallus gallus domestica*), eight from domestic fowl/pheasant (*Gallus/ Phasianus*), three pheasant (*Phasianus colchicus*), two mallard (*Anas platyrhynchos* cf, *domestica*) and one bone from a griffon vulture (*Gyps fulvus*).

Small quantities of domestic fowl (*Gallus gallus domestica*, n= 42), two bones of mallard (*Anas platyrhynchos* cf, *domestica*), a partridge (*Perdix perdix*) and an unknown member of the Charadriiformes were recorded from 3rd-4th century deposits at the Roman villa of Bela Voda, just to the south-west of Sofia (Iliev et al 1992).

The discovery of domestic fowl bones is recorded for a number of other Roman sites in Bulgaria including Abritus, Armira, Ivailovgrad, Kostinbrod and Sofia (Boev 1996). Three Roman sites have produced comparatively large assemblages of bird bones. These are the late Roman fortresses of Iatrus (Krivina) and Novae (Svishtov), both on the Danube and the site of Dichin, 15km to the west of Nicopolis, on the south bank of the river Rositsa (Fig 1.2). For Iatrus a small quantity of bird bones has been published from the 1970–72 excavations (Bartosiewicz and Choyke 1991). Domestic fowl (n=5), white pelican (*Pelecanus onocrotatus*, n=3), crane (*Grus grus*, n=3), white-tailed eagle (*Heliaetus albicilla*, n=2), cormorant (*Phalacrocrax carbo*, n=1), white swan (*Cygnus olor*, n=1) and white stork (*Ciconia ciconia*, n=1) were all recorded. At the Roman fortress/town of Novae, a series of publications record small quantities of bird bones (Chrzanowska and Molenda 1983, Makowiecki 1999, Schramm 1975, 1979, Waluszewska-Bubien and Krupska 1983). Species noted include domestic fowl (*Gallus gallus domestica*), geese (*Anser sp.*), pochard (*Aythya ferina*), white pelican (*Pelecanus onocrotalus*), mute swan (*Cygnus olor*), goshawk (*Accipiter gentilis*) and rook (*Corvus frugilegus*). At Dichin, more than 200 hundred bird bones have been recovered from the recent 1996–2001 excavations (see above, p. 14). The majority of these belong to domestic fowl (n=283), with small quantities of domestic geese (n=2) and possibly duck (n=1). Wild bird species include ?golden eagle (cf, *Aquila chrysaetos*, n=2), black grouse (*Tetrao tetrix*, n=8), crow/rook (*Corvus corone*/*frugilegus*, n=3), great crested grebe (*Podiceps cristatus*, n=1), partridge (*Perdix perdix*, n=1), jay/nutcracker (*Garrulus glandarius*/*Nucifraga caryocatactes*, n=3) and pigeon/dove (*Columbia sp.*, n=4). This assemblage, not surprisingly, is similar to that from Nicopolis since the sites are close together and the occupants of both the city and the fort no doubt exploited similar, if not the same habitats.

Overall, the available evidence points to the importance of poultry husbandry although, clearly, the exploitation of game fowl and wild birds was also important in certain parts of Bulgaria.

Conclusions

The bird bone assemblage from Nicopolis represents the richest and most diverse subfossil avifauna ever published from an archaeological site in Bulgaria. Nicopolis occupied a favoured location, with rich local fauna and flora and with freshwater, woodland, open land and rocky lands providing suitable habitats for different kinds of birds. The subfossil avifauna is notable for its diversity, in terms of its species composition, as well as for the quantity of material recovered. The bird remains analysed represent 42 species, 5 genera, 4 families and 3 orders, a total of 55 taxa.

Poultry farming was already underway during the very earliest period after the establishment of the city. It was based chiefly on raising domestic fowl which accounts for 96% of all domestic bird remains. To judge from their relative size, there were two, possibly three, distinct breeds. The rooster/hen ratio was about 1:1.2. The keeping of domestic goose seems to have been only of limited importance in the Roman to early Byzantine period.

There was a diverse range of wildfowl, including at least 22 species, of which the most popular game birds would seem to have been partridge and quail. The inhabitants of Nicopolis probably hunted most often across open farmland and grassland. Fowling was no doubt carried out throughout the year, not just during the summer, and would seem to have been most important between *c* 250 and 450: the bones of at least 10 wildfowl species have been found in deposits dating to this period. The cooking of bird meat, both wildfowl and domestic fowl, was probably done mainly by boiling or roasting over a temperate fire, since traces of burning on the bones are extremely rare. The presence of twelve species has been recognized in the archaeological record for the first time in Bulgaria; the lammergeier, little bustard, stock dove, wood pigeon, rock partridge, nightjar, (?)linnet, starling, chaffinch, wigeon, teal and garganey.

It is to be hoped that further efforts will be made to recover bird bones from archaeological sites in Bulgaria. The avifauna from Nicopolis demonstrates how valuable such remains can be for our understanding of the environmental setting, as well as economic aspects of settlements in the region. Only if archaeologists ensure that appropriate retrieval methods are used on excavations, such as the systematic use of sieving, will progress be made and useful assemblages of bird bones retrieved for future research.

Acknowledgements

The Palaeontological Institute of the Russian Academy of Sciences in Moscow kindly allowed access to its bird reference collections. Andy Hammon (Department of Archaeology, University of Sheffield) generously provided details of his work on the bird bones from Dichin in advance of publication. Dr. Andrew Poulter encouraged our study of the interesting bird bone assemblage from Nicopolis, and provided us with important background information as well as details on the character of archaeological deposits and their dates. Dr. Daniel Makowiecki (University of Poznan) provided us with copies of the zooarchaeological reports published by the Polish expedition to Novae.

14

THE HUMAN SKELETAL REMAINS

by

Helen Bush

SKELETON 1

This partial skeleton, orientated south-west by north-east was recovered from a shallow grave cut into destruction debris covering the floor of the nave within the 'Large Basilica.' Consequently, the burial must postdate the abandonment of the early Byzantine site. There is early medieval occupation immediately to the north (9th/10th century) and possibly later medieval (14th century) activity in the area (Poulter 1995, 47–8). Two post-medieval houses were built either side of the ruined basilica. Since the grave lay immediately below topsoil, it is not possible to determine to which, if any, of these periods it belonged. The skeleton is in poor condition, with considerable post-mortem erosion of the cortical bone and damage to the articular surfaces. The cranium is shattered.

Skeletal elements present:

Cranial fragments

Six cervical vertebrae
Two thoracic vertebrae
Nine thoracic neural arches
One fragment lumbar vertebral body
Sacrum

Ribs
Right clavicle
Right scapula
Right and left humeri
Right and left radii
Right and left ulnae
Eleven immature carpals
Nine metacarpals
Fifteen phalanges

Right and left ilium
Right and left femora
Right and left patellae
Right and left tibiae
Right and left fibulae
Tarsal fragments
Nine metatarsals
Ten phalanges

These elements indicate that this individual was developmentally immature. The lack of long bone fusion suggests an age of less than 14 years, while femoral length refines this to between 10 and 14 years. The dentition, which is less susceptible to disturbance and therefore a more reliable indicator of sub-adult age, indicates that the individual was at least eight years of age, because the premolars had erupted into the oral cavity. The moderate amount of calculus on these teeth suggests that this was not a recent occurrence. Incomplete root formation points to an age of less than 12–14.5 years. In summary, an age of between 8 and 12 years is proposed.

The assessment of gender is not possible in sub-adult material, and has not been attempted. Little more can be said about this adolescent, other than that, in the right orbital cavity, now broken, there are traces of cribra orbitalia, of moderate severity; the lesions present as a combination of large and small scattered foraminae. An explanation of this condition is given in the account of Skeleton 2 (below).

F 3095, the 'Large Basilica,' grave cut into the final destruction level, 600+.

SKELETON NUMBER 2 (Fig 14.1)

This skeleton was recovered from the bottom of a post-medieval robber-trench (4424) which followed the foundations of the medial wall between nave and narthex. The skeleton was flexed and lay awkwardly on the very bottom of the trench. The body must have been unceremoniously dumped into the trench before it was backfilled and before any silt had accumulated in the bottom of the cut. No finds were associated with the skeleton (Poulter 1995, 183 and fig 68, 178). The partial skeleton is represented by the skull, the vertebral column, the innominates and the lower limbs. Bone condition is variable: the skull and vertebrae are pristine, but the innominates are fragmentary and eroded, and there has been some damage to the articular surfaces of the long bones of the legs.

Age and gender

The individual represented by these remains has been assessed as male on the basis of cranial features and femoral dimensions; unfortunately, the pelvis was too fragmentary to be of use. Estimation of age is hampered by the incomplete nature of the innominates and the presence of dental pathology. However, bearing the latter in mind, the application of Brothwell's (1981, 72) attrition chart indicates an age of between 25 and 35 years. The pubic symphyses are incomplete but are sufficient to allow comparison to the revised male age standards of Suchey-Brookes (1988), which suggested an age range of 23–57 years. When modified to one standard deviation, which is felt to be adequate for archaeological populations (Bush 1990), an age in the range 26–45 years is produced. The final estimate of age for this individual is between 25 and 45 years.

Metric analysis

a) Stature. This was calculated using the formula of Trotter and Gleiser (1952, 1958, in Brothwell, 1981). Combinations of femur and tibia length produced a stature estimate of 1.74m, and femur and tibia length of 1.75m.

b) Cephalic index. The skull of this individual is very well preserved, permitting a range of measurements to be taken, although the fragmentary nature of the other skeletal remains, together with the many hundreds of years which separate them, mean those comparisons cannot be made. In view of the completeness of the cranium of Skeleton 2, the cephalic index (Brothwell 1981) was calculated to define head shape. The index is 72.0, which indicates that this man was dolichocephalic (long-headed) as opposed to being mesocephalic (average shape) or brachycephalic (round-headed).

Non-metric traits

Non-metric or discontinuous traits are used frequently to assess the degree of biological variability within and between skeletal samples. Cranial non-metrics usually are held to have a genetic cause, but while the potential for their occurrence may be genetic in many cases, their presence in the individual may result from a combination of genetic and developmental factors. A very generalised view is that bilateral traits are genetic, while unilateral presentation indicates developmental influences.

Cranial and post-cranial non-metric traits were recorded for Skeleton 2 because, although their interpretation in a single individual is limited, the future recovery of additional, well-preserved skeletal material from Nicopolis may permit comparison. The following non-metric traits were recorded:

a) cranial:
bilateral lambdoid ossicle
bilateral coronal ossicle
(sagital suture is obliterated)
foramen spinosum open bilaterally
right foramen ovale incomplete
right supraorbital foramen present as a notch
left supraorbital foramen complete
bilateral mandibular tori.

b) post-cranial:
transverse foramen of cervical vertebrae bipartite: 2 right and 2 left
left accessory sacral facet
bilateral vastus notch of patellae
exosteses in trochanteric fossa of right femur
third trochanter of right femur
bilateral lateral tibial squatting facets
left anterior calcaneal facet double.



Fig 14.1 Skeleton from the Small Basilica, area K

Other developmental anomalies

This man had 13 thoracic vertebrae; the usual complement is 12, but it is not uncommon to find 11 or 13. In addition, the lambdoid and coronal sutures are considerably more convoluted than is usual.

Pathology

a) osteoarthritis. Early arthritic changes in the form of slight lipping affect the articular surfaces of the tarsals and the proximal facets of the metatarsals. The only carpal bone present is a pisiform, tentatively identified as the left, which also shows slight lipping of the articular facet. The left acetabulum, although very friable and damaged, reveals what may be early osteoarthritis; the portion of the rim beneath the anterior inferior iliac spine is thinned and somewhat distorted.

Clear evidence for vertebral osteoarthritis is present. Mild lipping of 44 cervical and thoracic posterior, intervertebral facets was noted out of a total of 80. All 29 lumbar posterior, intervertebral facets are affected; the L1 is involved only mildly but L2–L5 show more severe changes. Both posterior sacral facets show mild lipping. Severe osteophytosis (ie, flanges of new bone on the superior and inferior borders of the vertebral bodies) affects the fifth and sixth cervical vertebrae, and the second and seventh to a much milder extent. Five thoracic (T2, T4, T7, T10 and T13) were slightly affected, and T8–T10 more severely. All five lumbar vertebrae and the superior surface of the first sacral vertebra have osteophyte formation, L2–L4 being most severely affected, with erosion of both borders of L3.

b) Schmorl's nodes. These lesions of the superior and inferior vertebral body surfaces are formed during childhood and adolescence as a consequence of mechanical strain. At this time the intervertebral discs are composed of a gelatinous nucleus surrounded by a fibrous capsule, the whole being covered by an elastic membrane. Severe strain can rupture the fibrous capsule, permitting the escape of the nucleus, but the outer elastic membrane stretches and contains the nucleus which presses against the surface of the vertebra next to it. Sometimes the vertebra above and below the damaged disc will respond to the pressure of the nucleus so that an impression of it, a Schmorl's node, is left (Wells 1982, 154).

The superior and inferior surfaces of T8, T11 and T12 have Schmorl's nodes, as do the inferior surfaces of T9 and T10 and the superior surface of T13.

c) Cribra orbitalia. This is a condition which affects the orbital cavities. It may range in severity, appearing as fine, capillary-like impressions on the bone surface, scattered fine foramina or cribrous lesions, large and small foramina, or the linking of these features into a trabecular structure which at its most severe may stand proud from the orbital surface. The cause of these lesions is the expansion of red bone marrow in the diploic spaces of the cranium (the flat bones of the skull, usually the parietals, may be involved also). This process can occur in a number of diseases, including hereditary haemolytic anaemias such as sickle cell and thalassemia, and also iron deficiency anaemia.

Bilateral, moderately severe cribra orbitalia is present in this individual, the foramina being joined into a trabecular structure. None of the other cranial bones are involved. Angel (1966, 1967) concluded from his study of Eastern Mediterranean Neolithic and Bronze Age skeletal remains that thalassemia is an adaptive response to falciparum malaria, the associated abnormal red blood cells reducing the severity of symptoms. The present author is not aware if this form of malaria was endemic in Bulgaria during the lifetime of the individual described here but it is a possibility to consider. Expansion of the marrow cavity would go some way to identifying an hereditary anaemia, but unfortunately it has not been possible to take radiographs of the femora. However, the lesions in the left orbit are less extensive than in the right, and appear to be inactive (ie, they are being remodelled). Bearing in mind Stuart-Macadam's (1985) proposal that lesions in the orbits of adults are the unremodelled remnants of a childhood episode of anaemia (the exception being individuals with hereditary anaemias who live into adulthood with chronic marrow hyperactivity) it may be that the orbital lesions in this case represent an iron deficiency anaemia. This is not to say that the diet was iron-deficient, since it is the amount of iron actually absorbed which is crucial. For example, an individual may consume a diet rich in iron but

may be anaemic if he or she suffers from parasite infestation; parasites not only consume blood but cause intestinal bleeding.

Dentition

All teeth are present with the exception of the maxillary left third permanent molar, which either has been lost or, more likely, was never present. A number of teeth have been affected by caries: the entire crown of the maxillary right second permanent molar has been destroyed so that only the three separate roots remain; there are mild lesions of the mesial surface of the maxillary right third permanent molar, the distal surface of the maxillary left second permanent molar and the occlusal surfaces of the mandibular right second and third permanent molars and the left first permanent molar. There is incipient caries of the distal surface of the maxillary right first permanent molar.

All teeth have calculus adhering to them, the mandibular teeth being more severely affected than the maxillary. In general, the maxillary lingual/palatal surfaces have only a small amount of calculus, with the labial/buccal surfaces being more severely affected. The surfaces of the mandibular teeth are affected equally, except for the left canine, premolars and molars, the lingual/palatal surfaces of which are more heavily affected than the labial/buccal surfaces.

A circular aperture in the alveolar bone at the buccal root of the maxillary right first molar indicates the site of drainage of an infection caused by pulp exposure consequent to destruction of the tooth by caries. In addition, heavy wear of the maxillary right central incisor has caused pulp exposure with a subsequent infection, which appears to have drained through an aperture at the root tip through the labial surface of the alveolar bone. There is some loss of inter-dental crest height between the mandibular canines and premolars and ‘bossing’ of alveolar bone on the labial/buccal margins of the tooth sockets for mandibular canines, first molars and right second molar. Together with the presence of sub-gingival calculus at all sites, these factors indicate a level of periodontal disease in this individual.

Dental enamel hypoplasia (an indicator of growth disruption as a consequence of systemic insult) is evident on the maxillary central incisors, with more marked lesions of the maxillary first premolars. The remaining teeth could not be assessed because the crowns were obscured by calculus.

K 4420, the ‘Small Basilica,’ within a robber-trench, 1750–1850.

SKELETONS 3 AND 4

The poorly preserved remains of an adult, orientated east/west, and a child came from a clay deposit, cut by the foundations for the construction of the early Byzantine defences; possibly the location of a late Roman Christian cemetery (Poulter 1995, 227–8).

a) The adult is represented by
left humerus
left and right radii
left and right ulnae
left and right femora
left and right innominates
sacrum
3 fragments of thoracic vertebral bodies
1 neural arch of a lumber vertebra (?L1/L2)
left hamate
left second, third, fourth and fifth metacarpals
right metacarpals
5 phalanges.

The preservation of these remains varies from complete (right metacarpals) to fragmentary (innominates, sacrum and vertebrae).

Age and gender

Examination of the fragmentary pelvis permitted gender to be tentatively identified as female; there is a wide sciatic notch and the preauricular sulcus, unfortunately broken post-mortem, appears to be deep and wide. In addition, the femora are gracile and the vertical diameter of the head falls into the ‘female?’ category (Bass 1986).

The sole feature with which to assess age is the auricular surface of the pelvis, which indicates an age in the range 30–49 (Lovejoy *et al* 1984).

Pathology
There is thinning of the cortical bone of the left femoral head, the appearance being that of early degenerative change.

Non-metric traits
a) An Allen's fossa is present bilaterally.
b) The child is represented by the left ischium and the shaft of the right femur. An age of less than 7–8 years is probable because the ischium is still unfused to the pubic ramus. Nothing more can be said of this child.
S, 5294, The east gate, *c* 1750+.

Assorted skeletal fragments
Proximal two thirds of left third metatarsal
E 1036, south gate, occupation surface, 450–600.

Fragment of left femoral shaft
C 4123, Roman gate, spread of domestic debris, 150–175.

Fragments of left parietal, ?occipital
F 3182, floor of Slav grubenhaus, 800–1000.

Fragment of right parietal
F 3330, The 'Large Basilica,' make-up deposit for nave floor, 450–600.

Fragment of right acetabulum and superior ramus of pubis
P 5018, make-up dump from the interior of the tower, taken from the destruction level within the Roman city, *c* 450.

Fragment of left tibial shaft
P 5022, dump of destruction debris, 250–300.

Assorted immature skeletal elements
lumbar vertebra (?fifth)
left talus
left calcaneus and epiphysis
distal epiphysis of right fibula
distal epiphysis of left tibia
five phalanges (foot)
patella (?side)
left and right first metatarsals and unfused proximal epiphyses
left and right second, third and fourth metatarsals
left navicular
left and right first cuneiform
?right cuboid
?left second cuneiform
left third cuneiform
1 proximal and 3 distal epiphyses of bones of foot.
S 5258, rubble level, probably representing primary robbing dump deposited during the dismantling of early Byzantine defences (above final 6th century destruction level), possibly deposited during the robbing of the foundations if they cut a southern extension of the late Roman cemetery noted above (R 5294). This would help to explain the disparate nature of this assemblage. However, the context itself is post-medieval, 1750+.

15

THE BOTANICAL REMAINS

by

Johnna Buysse

Introduction

Identification of the plant remains has revealed a wide range of plant species present on the site and dating from the 2nd to 7th centuries AD, the 10th/11th centuries, and the post-medieval period. This report describes the evidence and seeks to explain the finds in terms of the crop husbandry practices employed. First, the plant samples are analyzed in order to determine the range of material present and to understand the various factors that led to the deposition of those samples. Then the character of the samples is discussed with reference to the areas and contexts from which they came, the aim being to determine how the botanical composition of the samples may reflect changes in agricultural practice. Note, sample numbers are followed by the relevant context numbers in round brackets.

On-Site Methodology

Sampling

During the first year of excavation, 1985, no environmental specialists were included in the team but 6 litre soil samples were taken from larger contexts, 100% from contexts smaller than 6 litres. Environmentalists were on site during the rest of the field-work programme (1986–1991). Initially (1986–7), all contexts were sampled whenever possible and 10 litre samples were taken. However, emphasis during these two seasons was placed on 'sealed' contexts, ie, those contexts which could be most accurately dated and where contamination was unlikely to have occurred. In 1988–90, environmental sampling was restricted to significant contexts, particularly those which were 'sealed' or those which produced large samples of about 50 litres. A total of 421 botanical samples were collected at Nicopolis between 1985 and 1990.

Recovery and Sorting

The retrieval system used was one of continuous washover (Badham and Jones 1985). All samples taken (the volume recorded in litres) were processed on site. Each sample was washed in water and stirred by hand in a large plastic dustbin. The contents were then repeatedly poured over a 500 micron sieve until only sand and gravel remained in the dustbin. The residues from the container were then wet-sieved, again using a sieve mesh of 500 microns. Both flots and residues were allowed to dry. All residues were sorted on site by eye, though very little botanical material was recovered. Priority was given to washing all samples, but there was sufficient time to sort approximately fifty percent of all flots. In 1986 some preliminary identifications were made by the archaeobotanist, Ms. J. Fitt, and comparisons were made with modern plant material collected in the vicinity of the site.

Laboratory Methods

Sorting in the laboratory

The remaining unsorted flots were returned to the University of Nottingham, some of which were

sorted by the Chief Technician (Bob Alvey) in the Department of Archaeology, University of Nottingham. Remaining unsorted flots were brought to the University of Sheffield and sorted by the author. Most samples were fully sorted. However, samples of large volume were sub-sampled using a riffle box (Van der Veen and Fieller, 1982). Since samples containing thirty or more items were included in the following statistical analysis, fractions from sub-sampled material were sorted until more than thirty items were recorded or until it was obvious that very few plant remains were present.

The flots were passed through 1mm and 500 micron sieves. The 1 mm material was sorted by eye, while the 500 micron material was sorted using a Carl Zeiss Jena GSM microscope with magnifications of ×8 and ×32. In total, 421 samples were processed for this report.

Quantification

Resorting of botanical material obtained from the flots and residues was then carried out for all samples in order to separate countable from non-countable material. For grains, embryo ends were considered countable since they occur only once on each grain. For pulses, again, the embryo was the countable characteristic, with a split grain counting as 1/2. In this way, the same seed could not be counted twice.

Identification and species representation

The identification of the material was carried out using the archaeobotanical reference collection in the Department of Archaeology and Prehistory at the University of Sheffield. A Carl Zeiss Jena GSZ microscope was used at magnifications of up to ×40. A full list of the species identified is provided in Table 15.1. Detailed sample contents are provided in the lists of cultivated and wild species (Appendices 15.2 and 15.3) which are not published in this volume but may be consulted though ADS (above, p. vii). However, the full listings of the forty-nine samples included in the statistical analysis is contained here in Appendix 15.1.

All plant remains recovered, apart from several mineralised grape pips, were carbonized. Plant remains that had been distorted by carbonization so that their shape did not correspond to standard identification characteristics, or that were too fragmentary to allow positive identification, were assigned to an intermediate category. Large numbers of a particular type will be taken to indicate the presence of that category, whereas small numbers may only be atypical grains of other species.

Cereals and pulses

The identification of cereal grains is based on morphology. Though most grains could only be assigned to the genus level, wheat (*Triticum*) and rye (*Secale*) grains were assigned to species wherever possible. Einkorn (*Triticum monococcum*) included grains from both one-seeded and two-seeded spikelets. Two species of free-threshing wheat, bread wheat (*T. aestivum*) and macaroni wheat (*T. durum*), cannot be distinguished on the basis of grain morphology. These grains were grouped into an intermediate category, *T. aestivum/durum*.

The barley grains identified include both straight and twisted types. Only those which showed no signs of distortion were assigned to either straight or twisted categories, since grains twisted due to distortion and those twisted during normal growth are not easily distinguishable. The identification of twisted grains shows that six-row barley (*Hordeum vulgare*), which can have both straight and twisted grains, is present. The additional presence of two-row barley (*H. distichon*), which has only straight grains, cannot be excluded. All grains which were preserved well enough to be assigned to either hulled or naked categories were hulled.

Oat (*Avena*) was only identified to genus. The identification of oat to species is only possible using lemma bases. Only one lemma base was found in the Nicopolis samples and this was poorly preserved. The presence of oats, but in small quantities, suggests that this species is a wild contaminant.

Common millet (*Panicum miliacium*) was easily identified and is a common species in many samples.

Table 15.1 List of botanical species identified

Cultivated Species

Cereals :
Triticum monococcum (Einkorn)
T. spelta (Spelt)
T. aestivum (Bread Wheat)
Secale (Rye)
Hordeum (Barley)
Avena (Oat)
Panicum miliacium (Common Millet)

Fruits and Nuts:
Juglans regia (Walnut)
Rubus fruticosus (Blackberry)
Prunus persica (Peach)
P. dulcis (Almond)
Vitis sp. (Grape)
Cornus mas (Cornelian Cherry)

Pulses:
Pisum sativum (Common Pea)
Vicia ervilia (Bitter Vetch)
V. faba (Field Bean)
Lathyrus sativus (Grass Pea)
Lens culinaris (Lentil)

Wild Species

Polygonum aviculare agg.
P. persicaria
Bilderdykia convolvulus
Rumex sp.
POLYGONACEAE
Chenopodium hybridum
C. album-type
Atriplex sp.
Chenopodium/Atriplex sp.
Portulaca oleraceae
Agrostemma githago
Silene sp.
CARYOPHYLLACEAE
Ranunculus sp.
Papaver sp.
Brassica/Sinapis sp.
Agrimonia sp.

LABIATAE
Ajuga sp.
Teucrium chamaedrys
Teucrium sp.
Solanum nigrum
Solanum sp.
Sesamum indicum
Plantago lanceolata-type
Plantago sp.
Sambucus sp.
Valerianella sp.
Scabiosa sp.
Anthemis sp.

Potentilla sp.
Trigonella sp.
LEGUMINOSAE
Malva sylvestris
MALVACEAE
Cistus incanus
Peucedanum sp.
UMBELLIFEREAE
Sherardia arvensis
Sherardia sp.
Galium palustre
G. spurium
G. aparine
G. spurium/aparine
small *Galium/Asperula* sp.
Galium /Asperula sp.
Convolvulus arvensis

COMPOSITAE
Lapsana communis
Lolium sp.
Lolium sp.
Bromus sp.
Cynodon dactylon
Echinocloa crus-gali
Digitaria sanguinalis
Setaria verticillata/viridis
Echinocloa crus-gali/Setaria sp.
GRAMINEAE
Carex sp.
POLYGONACEAE/CYPERACEAE
Indet. sp.

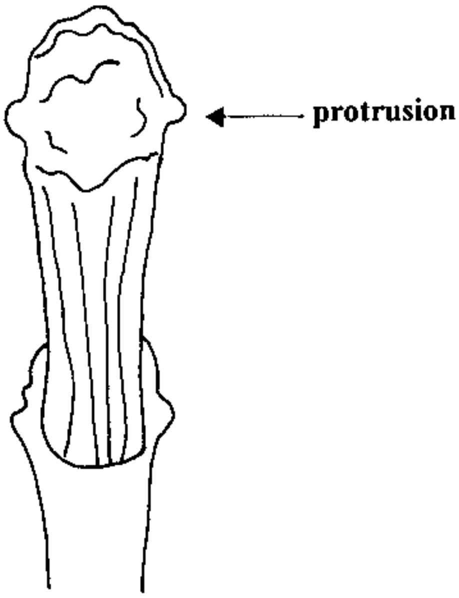


Fig. 15.1 Rye rachis internode (from sample 260)

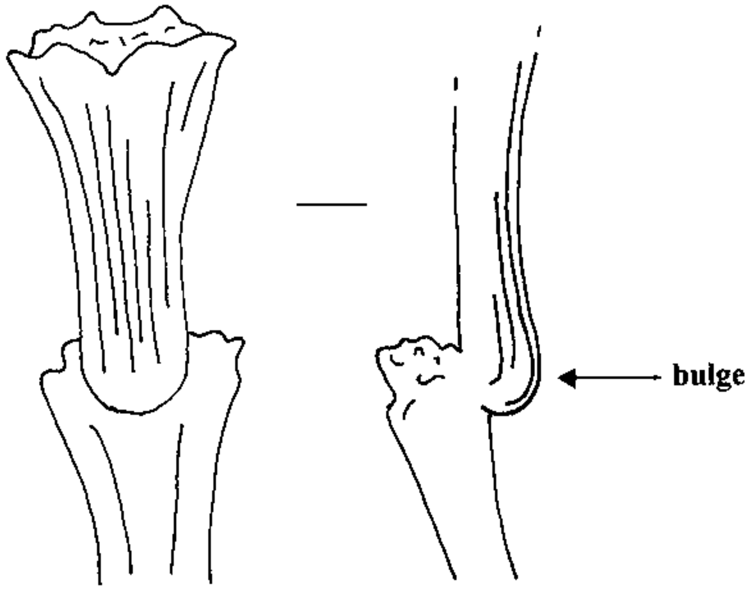


Fig. 15.2 Six-row barley rachis internode (from sample 261)

Identification of rachis internodes and glume bases followed the criteria used by G. Hillman. Several *T. spelta glume* bases were identified, indicating the presence of this glume wheat, although they were present in very small numbers. The identification of the rachis internodes of bread wheat (*T. aestivum*) confirms the presence of this species. No rachis internodes of macaroni wheat (*T. durum*) were found.

Rye and barley internodes were also identified; though at times distinguishing between the two was difficult. The primary criteria used for the identification of rye rachis internodes include their more slender shape, as compared to those of barley, and the distinctive protrusions on either side of the internode (Fig 15.1). The main distinguishing characteristic of barley was the presence of a distinctive bulge at the base of the internode (Fig 15.2). Of the five barley rachis internodes recovered, two were identified as coming from six-row barley; the remaining three internodes could not be identified since they were poorly preserved. Those internodes that displayed characteristics of both rye and barley were placed in an intermediate category. Also present were free-threshing rachis internodes which could not be assigned to a genus because they were so poorly preserved. One cereal-sized culm node was identified.

The seeds of lentil from the Nicopolis samples vary in size and could not confidently be taken further than Lens sp. However, since this species appears in post-medieval contexts, and in quantity, the seeds are probably the cultivated species, *L. culinaris*.

Other legumes found include bitter vetch (*Vicia ervilia*), common pea (*Pisum sativum*), field bean (*Vicia faba*) and grass pea (*Lathyrus sativus*). Legumes which could not be identified to genus or species were assigned to a large-seeded legumes category.

Edible fruits and nuts

Fragments of walnuts (*Juglans regia*) were identified using the criteria recommended by Renfrew (1973, 156). Other fragments of what could be either nutshell or fruit stones were grouped together into one category. However, in all cases, much fragmentation had occurred, suggesting that the pieces were not from fruit stones but from nut shells.

The pips of grapes (*Vitis* sp.) were identified, though only to genus level. The problem involved in distinguishing wild from cultivated forms of grape has been the subject of much discussion (Renfrew 1973). Sample 466 (1194) contained fruit fragments of one grape pip, and samples 203 (1064) and 243 (1053) contained charred stalks as well as pips.

A fragment of Cornelian cherry (*Cornus mas*) was found in an early Byzantine context in area P (5050).

Seeds identified and assigned to the *Rubus fructicosus* agg. category 'blackberry,' include a whole range of species which are very difficult to differentiate one from the other.

Seeds of *Sambucus* sp. (elderberry/damewort) were present but could not be identified more precisely. These are included with the wild species.

Other fruit and nuts identified include peach (*Prunus persica*) and almond (*Prunus dulcis*).

Wild Species

Some of the wild species will be discussed in this section, but a full list of the species identified in the Nicopolis samples is provided in Table 15.1. Some seeds could not be identified beyond genus level, others not beyond that of family. This was due either to bad preservation or to the absence of some species in the comparative collection used. Wherever possible, seeds were identified to species and particular attention was paid to those species which were commonly represented in the samples.

Polygonum aviculare agg: several seeds were identified to this category which includes a range of species which are difficult to distinguish from each other.

Chenopodium album-type: seeds which closely resembled those of *Chenopodium* album have been tentatively assigned to this species, one of the most common identified in the samples.

Plantago lanceolata-type: this seed type resembles *Plantago lanceolata*, the species to which it was tentatively assigned. This species was rarely attested in the samples.

Galium sp: only three species of *Galium* (*G. aparine*, *G. spurium*, and *G. palustre*) were found. The following criteria, based on those used by Lange (1979), were used for their identification. Firstly, the size of the seed: *G. aparine* was slightly larger than *G. spurium*, and *G. palustre* was even smaller still. Secondly, the shape of the elliptic cavity on the ventral side of the seed (place of the hilum). The cavity of *G. aparine* was relatively small and well-rounded whereas that of *G. spurium* was more elongated across the seed, so that it appeared that the seed was elongated from top to bottom, although the cavity was elongated horizontally. The cavity was thus often closer to the outer edge of the seed at the sides than either the top or the bottom. The cavity of *G. palustre* was even more elongated across the seed than in the case of *G. spurium*. The third criterion used was surface pattern, particularly on the dorsal side of the seed, since the surface pattern on the ventral side near the cavity was distorted in some cases. The surface pattern of *G. aparine* was one of very elongated, regularly spaced cells, whereas that of *G. spurium* was characterised by shorter, though still slightly elongated cells, arranged in a less regular pattern. Where visible, the cell pattern of *G. palustre* was one of very small, rounded cells tightly packed together. Of the three criteria, the third, surface pattern, was often the most difficult to use because, with some seeds, it proved difficult to distinguish between the outer surface and the inner fruit wall (van Zeist and Buitenhuis 1983). Identification to species was made only when at least two of the three criteria were successfully applied. Those seeds which displayed characteristics common to two species were put into a *Galium/Asperula* category because it proved difficult to satisfactorily identify to genus level.

Further identifications

For purposes of analysis, the following conclusions were made:

Cereals

Those grains identified as *Triticum* indet. are *T. aestivum/durum*. The *T. aestivum/durum* grains are actually *T. aestivum* (bread wheat) because rachis internodes of this species were identified.
grains identified as *Secale/Avena* (rye/oat) are actually *Secale* grains, given the abundance of this species in the samples.

Wild sp.
Avena grains are wild contaminants.
those seeds grouped into the POLYGONACEAE/CYPERACEAE category are POLYGONACEAE since this was the dominant family in those samples positively identified. (Mostly, these were seeds that had no outer coverings so that distinguishing between the two families proved difficult).

Assessing the Data

Dating contexts

The samples from Nicopolis come from dated contexts ranging from the early 2nd to the late 6th century, the 10th/11th century and the post-medieval period. In the following analysis of the plant remains, contexts are generally grouped according to the major periods in the history of the site (Poulter 1995, xxx–xxi). In order to provide sufficient data upon which to base general conclusions, discussion is confined to periods of no less than a century. The grouping of context dates is further discussed below. A list of dates and the periods to which the samples have been assigned is included in Table 15.4. Particular attention has been paid to samples which can be dated to periods of one or two centuries. Other samples have been used to supplement the data obtained from the more closely dated contexts.

Objectives of the analysis

Ultimately the objective of this analysis is to understand the role of the various plant species in the general economy of Nicopolis throughout its history. However, it is first necessary to determine the nature of deposition. Without this knowledge, interpretation can be misleading. At Nicopolis, plant material (except for rare cases of mineralisation) has only been preserved when exposed to fire. Therefore, only in particular circumstances are seeds likely to survive in the archaeological record. These circumstances include, a) charring during a stage of crop processing when seeds are being dried or parched, b) when a diseased crop requires sterilisation, c) when crop processing waste is used as fuel, d) when food products are used in cooking, or e) during accidental destruction by fire (Hillman 1981). Each of these events is likely to produce different archaeological samples, both in terms of the species represented and the character of remains present, so that comparisons between samples derived from different processes could be highly misleading. It is therefore essential when assessing the importance of the various crops, as well as other aspects of crop husbandry, that samples are compared only when they come from similar stages in crop processing (Dennell 1972, 1974: Jones 1984, 1987). Activities such as threshing (to free grain and chaff from the ear), winnowing (to remove contaminants coarser than the grain) and fine sieving (to remove contaminants finer than grain) are all processes which are likely to leave some evidence that could be recovered in archaeological samples. G. Jones has introduced a method which compares archaeological samples with ethnographic evidence and allows the archaeological data to be interpreted as the result of specific crop processing activities. The analysis involves the use of statistics. The approach adopted in this report is based upon these procedures. When variations in the character of samples can be explained in terms of the crop processing activities which led to their deposition, then the samples can be used in the study of crop husbandry practices.

Identification of Crop Processing Activities

The ethnographic studies carried out by Hillman in Turkey (1981,1984) and Jones in Greece (1984, 1987) have shown that a number of components in archaeological botanical samples, including the number of crop seeds, chaff and straw fragments, and weed seeds, may be affected by crop processing. The products and by-products of each stage of crop processing should show differences in the relative proportions of these components. This section attempts to differentiate between samples which may have resulted from different stages of crop processing, using the observations made by Hillman and

Jones. The objective is to filter out variation due to differences in the character of crop processing as it affects the samples before using the evidence to answer questions regarding the agricultural economy of the site.

Samples used

The samples which were included in this analysis are those dated from the Roman to early Byzantine periods. The Slav (10th–11th century) and post-medieval samples are excluded from this stage of the analysis. Moreover, those samples selected contained 30 or more items, including grain embryo tips, glume bases, rachis internodes, culm bases, nutshell/stone fragments, and fruit and wild species seeds. Only the samples dated to periods of one or two centuries or less have been included in this analysis. The eight samples which were not accurately dated at the time when the primary research was carried out are here omitted from the statistical analysis. Given the small number of samples involved, it can be presumed that this omission did not significantly affect the results. In total, forty-nine samples are included in the statistical analysis.

Variables used

Ratio of Weed to Crop Seeds

The first variable calculated was the ratio of weed to crop seed in each of the forty-nine samples. The term 'weed' requires definition. 'Weed' here is used to refer to those wild species which were probably brought to the site with cultivated crops. In this sense, 'weed' refers to those species which were probably competing with the crop species in the field (see Harlan and deWet 1965, for a more detailed discussion).

All wild species were considered, including oat grains. Crop seeds included all other cereals and pulses. Fruits and nutshells were excluded from this part of the analysis. In general, one would expect a higher proportion of weed seeds in samples which constituted by-products from crop processing, ie, crop processing waste.

Ratio of Rachis to Grain

The second variable used was the ratio of rachis to grain. Only free-threshing cereal grains and rachis fragments were considered because of the different processing treatment necessary for glume wheats (Hillman 1981). Glume wheats were not considered because only very few were found in the samples.

Density

The third variable considered was the density of items per litre of soil. This may give indications as to the rate of deposition and help to distinguish between charred refuse discarded gradually over a period of time and the charred remains of single accidents during storage, cooking, etc. (Jones 1987).

Characteristics of Weed Seeds: BFH and SFH Seeds

The final two variables used considered characteristics of weed seeds and their connection with crop processing activities (Jones 1984, 1987). The characteristics of weed seeds considered were;

1) Size of seed. This characteristic is helpful in identifying fine sieving since only small seeds tend to pass through the sieve.
2) The tendency of seeds to remain on their heads or in pods after threshing. This characteristic is most likely to indicate coarse sieving, since seeds in heads tend to remain in the sieve.
3) The aerodynamic qualities of seeds, especially their weight, which can help to identify winnowing.

Essentially, this analysis is based on the observation that wild seeds, which are large and heavy and are similar to most cereal grains, are difficult to remove from products and often remain with the grain until a very late stage (such as hand cleaning). On the other hand, smaller wild seeds are more likely to be cleaned from grain samples by fine sieving. This will be discussed further below.

In order to determine which wild species to include in calculating these last two variables, the most

Table 15.2 Groupings of wild species according to weed seed characteristics (after G. Jones 1981)

Big, Free, Heavy seeds (BFH)	**Small, Free, Heavy seeds (SFH)**
B. convolvulus	*P. aviculare* agg.
A. githago	*Rumex* sp.
G. spurium	POLYGONACEAE
G. aparine	*C. album*-type
G. spurium/aparine	*Chenopodium/Atriplex*
Galium/Asperula sp.	*Silene* sp.
Sambucus sp.	LEGUMINOSAE
S. arvensis	
G. palustre	
small *Galium/Asperula*	
T. chamaedrys	
P. lanceolata	
C. dactylon	
E. crus-gali	
D. sanguinalis	
Echinocloa/Setaria	
S. verticillata	
S. viridis	
Carex sp.	
POLYGONACEAE/CYPERACEAE	

common weed seeds in the forty-nine samples were selected by excluding species present in less than 10% of the samples, ie, those which occurred in less than five samples. In this way, species which occur only occasionally in the samples, which would create unwanted 'noise' in the statistical results, are excluded. Also omitted were those seeds identified only to the family level of UMBELLIFERAE and GRAMINAE, since these groups contain seeds which exhibit varying characteristics depending upon genus and species. The families which were included in the analysis did not exhibit these varying characteristics. Twenty-five families (other than UMBELLIFERAE and GRAMINAE), genus, and species were used from a total number of sixty identified: the species eliminated from the analysis were present in few samples and in very small quantities. These species were then split into two groups (following the procedure recommended by G. Jones, 1984, 1987);

1) Large, free and heavy seeds (BFH).
2) Small, free and heavy seeds (SFH).

The group to which each of the species was assigned is illustrated in Table 15.2. The two variables used were the number of seeds in each category (BFH and SFH) in each sample.

Principle components analysis

In order to explore the relationships between these five variables (ratio of weed to crop seeds, ratio of rachis to cereal grain, density and number of BFH and SFH seeds), the forty-nine samples were subjected to a principle components analysis (Kim 1975). This type of analysis reduces the variables to a smaller number of components. Variables which load high, either positively or negatively, on the same component are more strongly associated than those which have low loadings. The loadings of each variable on the first and second unrotated component are given in Table 15.3.

It is evident, in the case of the first component, that the number of SFH seeds and the ratio of weed to crop seeds load high positively. This appears to indicate that those samples which contain a high ratio of weeds to crop seeds, also tend to have high levels of SFH seeds. Small seeds are removed during fine sieving, and this would explain the association between a high ratio of weed to crop seeds and the high occurrence of SFH seeds. The reverse, therefore, would indicate that those samples which

Table 15.3 Loadings of variables on the first and second unrotated principle component

Variable	Loading on 1st Component	Loading on 2nd Component
Number of SFH seeds	**0.98**	0.08
Ratio of weed to crop seeds	**0.98**	0.14
Density of items in soil	-0.07	**0.72**
Number of BFH seeds	0.11	**-0.66**
Ratio of rachis to crops seeds	-0.17	**0.56**
Eigenvalue	1.97	1.28
% variation accounted for	39.40	25.60

show a high ratio of crop seeds to weeds also tend to have low levels of SFH seeds, perhaps identifying fine sieve products. The low loading of BFH seeds indicates that there is little association between these seeds and the identification of fine sieve by-products and cleaned or semi-cleaned products. However, it does seem that the loadings on the first principle component do in fact differentiate between fine sieve products (low weed to crop seed ratio and few SFH BFH seeds) from fine sieve by-products (high weed to crop seed ratio and more SFH seeds).

On the second component, the ratio of rachis to crop seeds loads high positively along with density, indicating an association between these two variables. The number of BFH seeds, on the other hand, loads high negatively. Samples which have a high density, a high ratio of rachis fragments, and a low proportion of BFH seeds are characteristic of winnowing or coarse sieve by-products, since rachis is likely to be sorted out during this stage, and BFH seeds are more likely to stay with the crop seeds, given their similar size to larger-grained crops such as wheat and barley. An alternative explanation might be that several of the samples are cleaned or semi-cleaned millet products which have a high density of items (millet grains) and few BFH seeds which are easily cleaned from the millet grains given their larger size. Several of the samples do fall into this category. Therefore, the loading on the second principle component appears to identify winnowing or coarse sieve by-products (high density, high rachis ratio and few BFH seeds) and cleaned or semi-cleaned millet products (high density, abundance of millet and few BFH seeds).

Products and by-products identified

Since, with reasonable probability, it seems possible to identify at least three stages of crop processing (winnowing or coarse sieve by-products, fine sieved by-products, fine sieve products and cleaned or semi-cleaned millet products), the next stage in the analysis was to determine, for as many samples as possible, to which of these three categories they should be assigned. The following groups were identified:

1) Winnowing or coarse sieve by-product: high proportion of rachis fragments and a high density of items.
2) Fine sieve by-product: high proportion of weed to crop seeds, high proportion of SFH seeds.
3) Fine sieve product: a high proportion of crop seeds to weeds and, of those weed seeds present, few SFH seeds.
4) Cleaned or semi-cleaned millet products: characterised by an abundance of millet, high density and few BFH seeds.

Conclusions for the identification of crop processing activities

Appendix 15.1 lists the forty-nine samples, their botanical context, and the data used in the principle components analysis. Some samples exhibited the characteristics of more than one crop processing

stage; these samples have therefore not been identified as representing a single stage in crop processing. These samples will be discussed in detail in the following sections. These particular samples may well represent a mixture of different material derived from a variety of crop processing activities. On the other hand, since these samples also contain a wide variety of crop species, they may be remains from similar stages of processing but of different sized crops such as bread wheat and millet.

The 2nd century at Nicopolis was represented in the statistical analysis by two samples, both of which were identified as fine sieve products. The primary crop products from these samples included bread wheat, rye, barley and millet; only three weed seeds were present in these two samples.

Of the eight samples dated to the 2nd to 3rd centuries which were included in the statistical analysis, six were identified as fine sieve by-products and one exhibited characteristics of a millet product. Each of the samples identified as fine sieve by-products, samples 414 (677), 415 (681), 522 (5024), 527 (5025), 528 (5027) and 533 (5029), is characterised by a high ratio of weed to crop seeds as well as a dominance of SFH seeds. Sample 426 (691) was identified as a cleaned or semi-cleaned millet product; this sample was dominated by millet and SFH seeds.

The 3rd to 4th centuries were represented by a greater variety of crop processing stages than for previous periods. Of the eighteen samples included in the statistical analysis, ten exhibited characteristics of more than one crop processing stage. These samples will be discussed in greater detail in relation to context in the following discussion. Three samples, dated to the 3rd to 4th centuries, sample 517 (4866), 497 (5021) and 503 (5022), were identified as fine sieve by-products. Each of these samples were characterised by a high proportion of weed seeds, particularly SFH seeds. Samples 232 (306) and 260 (333) were identified as winnowing or coarse sieve by-products. Sample 232 (306) exhibited a high ratio of rachis fragments to cereal grains (free-freshing) and a high density of material. Sample 260 (333) exhibited similar characteristics, in addition to a high number of SFH seeds, and thus this sample may represent a mixture of winnowing or coarse sieve by-products and fine sieve by-products. The other crop processing stage represented in the 3rd–4th century samples was that of cleaned or semi-cleaned millet products. Samples 274 (335), 310 (337) and 304 (339) were dominated by millet; the occurrence of other crop seeds in these samples, such as bread wheat, millet and legumes, may represent a mixing of crop processing stages.

The samples dated to the 4th to 5th centuries which could be identified as resulting from a single crop processing stage consisted exclusively of fine sieve by-products. The remaining samples exhibited characteristics of multiple crop processing stages, primarily fine sieve products and fine sieve by-products. The secondary nature of the contexts of these samples may explain the mixing of crop processing stages.

The most common crop processing stage represented in the 5th to late 6th century samples was that of fine sieve by-products; samples 461 (5008), 467 (5013) and 551 (5047) are prime examples of this crop processing stage. Samples 538 (5037), 540 (5044) and 541 (5045) were identified as cleaned or semi-cleaned millet products with legumes. These samples exhibit the characteristics of millet products, including a high proportion of millet and SFH seeds, in addition to a number of field beans. It is uncertain whether these species were mixed in the field or during crop processing. The remaining samples, dating to the 5th to 7th centuries, could not be attributed to a single crop processing stage and may represent the mixing of crop processing stages.

The following section discusses these samples by period and in greater detail.

The Plant Remains by Period

Table 15.4 lists the date ranges assigned to contexts containing plant remains by area and shows how the dated contexts were grouped into seven periods for the present analysis. The periods proved the most efficient blocks by which the context dates could be amalgamated and correspond as closely as possible to the main periods in the history of the site (above, p. 4). Date ranges which spanned more than two centuries or which could not be allocated to one of the seven periods (such as the samples dated 400–500) are listed in the last row of the table as ‘Others.’ Since the dates of the samples

Table 15.4 Groupings of Nicopolis botanical samples by period

	Areas										
Century	**A**	**B**	**C**	**D**	**E**	**F**	**K**	**M**	**P**	**R**	**S**
2nd	100–130 130–175	100–130 130–150 130–175	100–150								
Mid 2nd-mid 3rd			150–175 150–250 175–250	150–175 175–250					150–250		
Mid 3rd- Mid 4th		250–275 250–350	250–350			250–350		250 250–350	250–350		250
Early 4th- mid 5th		300–450	300–450 450	350–450	400–450 450	400–450	250–450	350–450			
Mid 5th-early 7th	450 450–600		450–600	450–600	450–600	450–600			450 450–600	450 450–600	450 450–600
Early 9th- early 11th						800–1000					
Mid 18th- mid 19th	1750+	1750+	1750+	1750+	1750+	1750+			1750+		
Others		100–350 175–350	150–350 400–500	250–450	130–450					600–1750+	

Table 15.5 Summary of botanical samples by area and by period

Area	**2nd**	**Mid 2-mid 3**	**Mid 3-mid 4**	**Mid 4-mid 5**	**Mid 5-early 7**	**9-11**	**1750+**	**Others**	**No date**
A	6				58		4		
B	18		33	21			1	7	
C	1	9	4	11	2		4	4	
D		5		31	21		27	1	
E				14	35		5	1	
F			1	4	4	12	1		
K				3					
M			8	2					
P		7	3		19		1		
R					4			1	
S			1		12				
Total (in stat. anal.)	25 (2)	21 (8)	50 (18)	86 (11)	155 (10)	12	43	14	15
Total # of samples = 421									
Total # of samples in statistical analysis = 49									

included in this group could not be more accurately assigned, and the number of botanical remains present was very small, these samples were not included in the analysis. Because it is not possible to discuss each sample individually, discussion will focus primarily on the samples included in the principle components analysis. It is apparent from Tables 15.4 and 15.5 that some areas produced a more even distribution of samples throughout the history of the site and particular attention will be paid to samples from these areas.

As noted above, the forty-nine larger samples included in the principle components analysis are listed in Appendix 15.1. This appendix lists the following information: the period to which the samples belonged, sample numbers, area of the site from which the samples originated, context numbers, the sample density, the gravity of each botanical species present, and the data gathered for the statistical analysis, including the ratio of weed seeds to cereal grains, the ratio of rachis to cereal grains, number

of BFH seeds, number of SFH seeds, the ratio of Chenopodietea to Secalinetea character-species expressed as the percentage of Chenopodietea out of the total of the two groups together (both for number of seeds and number of species) and finally the crop processing group to which the samples were assigned. Note that, for each of the contexts, the information is contained on two pages, the first containing cultivated species, the second listing wild species.

The 2nd century

This period is represented by twenty-five samples from areas A, B and C. However, since area C produced only one sample of this date, areas A and B provided the best evidence for agricultural activity at this time.

The one sample from area A which was included in the statistical analysis, sample 403 (2277), was dated to the early 2nd century. The sample was interpreted as a fine sieve product, containing a high proportion of cereal grains, particularly bread wheat, but also rye, barley and millet, as well as some indeterminate legumes. The context for this sample was the fill of a pit or well (2268), predating the construction of a house towards the middle of the 2nd century. This sample may represent material lost during food preparation and then dumped, along with other domestic debris, including pottery, when the hole was backfilled (Poulter 1995, 53). All six samples from area A contained little or no weed seeds, possibly indicating that, by the time the crop material reached this area, it had already been cleaned of most of the undesirable material (weed seeds and rachis fragments).

As in area A, one sample from B was included in the statistical analysis, sample 172 (265). This sample was also interpreted as a fine sieve product, with similar crop species to the sample from area A including bread wheat, barley, rye and legumes. This sample came from the fill of a refuse pit (264). As in A, the eight samples from B dating to the early 2nd century (100–130) contained little or no weed seeds, indicating again that the crops were probably cleaned elsewhere before they were brought to this area of the site. The two large samples from areas A and B were not dense (respectively, 2.8 and 4.1 items per litre of soil). Thus, the remains probably represent domestic refuse resulting from the loss of grain during food preparations.

The ten samples dated to the mid to late 2nd century (130–175) from area B contained more weed seeds than the samples dated to the earlier part of the 2nd century. This may suggest a change in use of area B at this time, or perhaps it indicates a change in practice in that crops in this period were not cleaned as thoroughly before food preparations. Given the range of species and low density of material, these samples could represent loss of grains and seeds during the cleaning of crops and/or food preparation.

The samples dated to the early 2nd century from areas A and B indicate that the crop material was probably cleaned before it was brought to these areas. This does not, however, seem to be the case with the mid to later 2nd century in area B where weed seeds were more common. This may indicate that, in the later 2nd century, crops deposited in these areas were not as efficiently cleaned or that it was then anticipated that final cleaning of the crop was not carried out until it was about to be used. In any case, most of the samples from the 2nd century seem to result from loss during cleaning of cereal crops or during food preparation. At present, the only conclusion which can be drawn as to the crops utilized at Nicopolis at this time is that bread wheat and millet were probably deliberately cultivated: the status of the other species cannot be established.

The mid 2nd to mid 3rd centuries

Of the twenty-one samples dated to this period, eight were included in the statistical analysis. Samples dated to this period contained a greater range of botanical remains than the those dated to the earlier part of the 2nd century.

Only two of the nine samples from area C were from occupation layers, both of which contained few botanical items. The remaining seven samples dated to this period in area C were from the construction of the road and *propugnaculum*. Little information can be gained from these samples, due to the low quantity of botanical material.

Of the five samples from area D, four were included in the statistical analysis. Two, sample nos. 414 (677) and 415 (681), were identified as fine sieve by-products with high proportions of weed seeds, particularly those of small, heavy seeds. Both of these samples, as well as sample 399 (676), contained grape pips, suggesting mixing of material with cereal crop by-products. The nature of the contexts from which these samples were taken, dump deposits, ditches and rubbish pits, could account for the mixture of material. Sample 426 (691), from an occupation layer, was interpreted as a cleaned or semi-cleaned millet product. This sample, given the low density of material it contained, could have resulted from spillage during food preparations.

Four of the seven samples from area P were used in the statistical analysis; samples 522 (5024), 527 (5025), 528 (5027), and 533 (5029). The remaining three samples contained particularly high proportions of weed seeds. All of the samples included in the statistical analysis were interpreted as fine sieve by-products. Moreover, three of the samples were from pit or gully fills. Due to the similarity in sample composition and context type, the deposits in area P may have resulted from a single stage of crop processing. Possibly, the fine sieving of cereal crops was occurring in or near area P, or, at least, the by-products from the fine sieving were discarded in this area. A variety of species were present in these samples, so whatever activity took place here, it involved a number of different crops rather than one single crop. However, caution is required in interpretation since, again, these contexts represent secondary deposition. The species present included those already discussed, plus the first appearance of the common pea and blackberry.

Although the botanical remains were more abundant in the samples dated to this period than in the proceeding periods, the difference in their character is probably due to the different crop processing activities which contributed to their composition. In the earlier 2nd century, the samples included in the statistical analysis were primarily fine sieve products with few weed seeds; none of those samples were identified as crop processing by-products. Most of the samples, dated to the mid 2nd to mid 3rd centuries, were identified as crop processing by-products with high proportions of weed seeds. One difference between this and the previous period is the lack of einkorn grains. This crop was plentiful in the earlier 2nd century particularly in area B, but no grains of this species were present in the samples dated to the mid 2nd to mid 3rd century. A significant observation which emerges from the analysis of these samples is the abundance of fine sieve by-products from area P. The presence of this material may have resulted from the fine sieving of cereal crops in the vicinity, or at least the discarding of the material in this area. Crop species common during this period include millet, bread wheat, barley and smaller amounts of rye, lentil, bitter vetch, various pulse species, walnut, grape and blackberry.

The mid 3rd to mid 4th centuries

This period is represented by samples from areas B, C, F, M, P and S and include a total of fifty samples, eighteen of which were included in the statistical analysis.

The samples from area B were from the silting up and backfilling of a 3rd century ditch (294), running west/east and which had been cut across the Roman road after its paving stones had been removed (Poulter 1995, 71–3). Of the thirty three samples from area B, fifteen were included in the statistical analysis. Most of the samples from this period which were included in the statistical analysis were not attributable to a single stage of crop processing, indicating the mixing of materials. The nature of the contexts in this area (secondary deposits), suggests dumping of refuse and this would explain the mixing of botanical material. Of the five samples from area B which were identified as resulting from crop processing stages, two, samples 232 (306) and 260 (333), were identified as winnowing or coarse sieving by-products. These samples had high ratios of rachis fragments to cereal grain, and significantly high densities of items per litre of soil, suggesting rapid deposition probably associated with a single episode of dumping. Another crop processing stage which was identified represented a cleaned or semi-cleaned millet product in samples 274 (335), 304 (339) and 310 (337). The presence of other species implies mixing of crops but whether this mixing occurred in the field or during processing is unknown. The most likely explanation for the samples for area B is that they represent a number of stages of crop processing, mixed together during the regular dumping of

domestic refuse in the ditch, possibly belonging to a fort or defensive enclosure during the second half of the 3rd century, when it no longer served its original function (Poulter 1995, 114–16).

Four samples from area C were dated to this period. The one sample in C, sample 539 (5309), from this period which did contain 30 items or more was not included in the statistical analysis since it was dated after the main report had been completed. However, given the extremely high proportion of small, free, heavy weed seeds (396 seeds) to grains of barley (4 grains), the sample could be interpreted as a fine sieve by-product. Of the weed seeds, 92.42% (N=366) were identified as *Chenopodium album*. The context of this sample was the fill of a foundation cut for the external guard-chamber (*propugnaculum*). Unfortunately, the secondary nature of the deposit limits interpretation. Of the remaining three samples from this area, one, sample 509 (4129) produced no plant remains and two, samples 536 (5316) and 537 (5314), produced small quantities of barley, millet, bitter vetch, walnut and grape.

Of the eight samples from area M, one, sample 517 (4866), was included in the statistical analysis and was interpreted as a fine sieve by-product. This sample came from the mid 3rd century destruction deposit of roof tiles and timbers within the Roman house. The discovery of a stone mortar and quern *in situ* on the floor of the house suggests that the building, in its final period of use, was used for the preparation of food products (Poulter 1995, 198) The high proportion of weed seeds in this sample and in sample 574 (4962), from the demolition deposit within the peristyle, suggests that the material represents crop cleaning rather than crop storage. If the latter was the case, a higher proportion of crop seeds would have been expected. Crop species present in samples from area M, and dated to this period, include rye, barley, bitter vetch, walnut, peach and grape, albeit in small quantities.

Two of the three samples from area P, sample 497 (5021) and 503 (5022), were included in the statistical analysis and were interpreted as fine sieve by-products. The third sample, 495 (5020), also contained a high proportion of small weed seeds. The contexts for all three samples were interpreted as cultivation soils, predating the construction of the early Byzantine tower. These samples could represent weed plants burned *in situ* or, more probably, given the presence of millet and barley grains, could be part of domestic waste from a hearth or oven. The charred material may have been included in the ash and fresh plant waste used to fertilize the soil.

Only one sample, 577 (5293), was collected from a destruction deposit in area S. Very few botanical remains were present in the sample.

Again, most of the samples dated to this period were from secondary deposits. However, the samples are very similar to those from the previous period in terms of content and context type. Clearly, disposal of waste material containing botanical remains occurred in area B in this period. Finds, as well as the botanical samples from the Roman house in area M indicate that crop processing of barley and bitter vetch may have occurred in this building during its final occupation, about the middle of the 3rd century (Poulter 1995, 198). Ash or other household waste may have been used as fertiliser in area P. Again, these samples do not resemble those dated to the early 2nd century: the variety of species is much greater. In this respect, they do resemble more closely those dated to the 2nd to mid 3rd century. However, it should be noted that the quantity of samples dating to the 3rd to 4th centuries is much greater than those for the preceding period. In the case of area B samples of 3rd to 4th century date, the variety of their contents can be explained probably because they represent the dumping together of remains from a number of crop processing stages.

The early 4th to mid 5th centuries

This period is the most widely represented in the Nicopolis material and includes samples from areas B, C, D, E, F, K and M.

The samples from area B dated to this period total 21, most of which were from the cobbled road surface. They contained less plant material than earlier samples from the same area. This could be explained by a change in the nature of deposition: dumping of agricultural remains may not have been regularly carried out here during this period, perhaps because this cobbled area served as an extramural market (Poulter 1995, 74–5).

Eleven samples were recovered from area C, two of which were included in the statistical analysis. Sample 419 (4057) came from an occupation surface overlying the dismantled wall of the *propugnaculum*, and sample 421 (4060) was from the cobble repair to the road. Both samples were interpreted as fine sieve by-products. The very low density of items in these samples suggests gradual accumulation or dispersed deposition.

Area D is represented by thirty-one samples for this period. Most of the larger samples were from the backfill of a trench, which may have been dug to contain a water-pipe (Poulter 1995, 74–5). This context includes the only four samples from area D which were included in the statistical analysis. Whereas one of these samples, 422 (689), was interpreted as a fine sieve by-product, the others were mixed deposits and probably did not come from a single crop processing activity. These samples resembled those from area B of the mid 3rd to mid 4th century which appeared to represent the dumping of crop processing remains. Several of the samples in area D came from dump deposits and contained large amounts of weed seeds. The samples from the occupation deposit associated with the 'early building' demonstrate that agricultural activity was still taking place. Although sample 249 (576) was dated too late to be included in the statistical analysis, it contained a high proportion of weed seeds compared to crop grains suggesting that it was waste from the cleaning of crop products. Although not present in large quantities, a wide range of crop species was present in this sample and in the other samples from the occupation surfaces in this area, suggesting a variety of crops were still in use at Nicopolis between the early 4th and mid 5th centuries.

Fourteen samples from area E dated to this period. The three samples large enough to be included in the statistical analysis all originated from successive fills of the same pit (1188) (Poulter 1995, 129–30). Only one sample, 466 (1194), was interpreted as a fine sieve by-product. The remaining samples, 463 (1192) and 458 (1190), contained such high proportions of weed seeds, particularly big, heavy seeds, that they most likely resulted from a number of crop processing stages including hand cleaning of large seeds from crop products. Sample 463 also represented the first appearance of the field bean (*Vicia faba*), possibly coming in as a contaminant with the cereal crop. Sample 463 more closely resembles the samples from the previous period, both in terms of the density of plant items and in the types and quantity of species present. It is likely that these samples from the pit-fill represent material brought to the area *c* 450 from the Roman city's final occupation level in an attempt to level up the pit immediately before the construction of the early Byzantine defences.

Four Samples from area F dated to this period were associated with a clay floor, found beneath the early Byzantine basilica. Again, a variety of species are present in the samples dated to this period. The species included bread wheat, barley, rye, millet, various pulses, grape and blackberry.

Area K is represented by only three samples. The one sample from the clay floor of a 4th century building contained no plant remains, while two samples from dump deposits contained very few items. Little can be concluded regarding the botanical remains in this area.

Two samples from area M dated to this period were from rubbish pits. Both samples contained a high proportion of weed seeds, especially 531 (4871) which was interpreted as a fine sieve by-product. This and the other sample, 523 (4869), could represent loss of material during crop processing which was then dumped in rubbish pits. The range of species present is similar to those identified in samples of this period from other areas.

Many samples dated to the early 4th to mid 5th centuries represented secondary deposits, thus general conclusions about the status of the crop species at this time can only be tentatively suggested. However, those samples which came from primary deposits in area D did contain a wide range of crop species which does indicate that agricultural activity at Nicopolis continued during this period.

The mid 5th to early 7th centuries

This period is represented by a total of 155 samples from areas A, C, D, E, F, P, R and S.

Most of the fifth to early seventh century samples from area A which have been dated to this period came from secondary deposits although several occupation surfaces did produce cereal crop remains. Area A samples contained few weed seeds, possibly indicating that the bulk of the crop cleaning had

been carried out elsewhere before they were deposited here. The range of crop species from this area exhibited no notable differences from earlier periods. Sample 407 (2279) and 408 (2278) were associated with an oven (2261) (Poulter 1995, 62). These samples produced only a single weed seed and a wide range of crop species. This suggests that the oven may have been used in the preparation of cleaned crop products, given the low number of weed seeds.

The two samples from area C which are dated to this period contained few plant remains. Crop species represented included bread wheat, millet, lentil and grape: only one weed seed was present in these samples.

The twenty-one samples from area D dated to this period were from the 'workshops'. Most of the samples were from occupation surfaces and suggest that crop processing wastes were connected with the use of the building. An explanation for the abundance of plant material in these samples may be that it was used as fuel for fires. Three of the richer samples, 158 (516), 328 (607) and 362 (636), contained a wide range of species and suggest the mixing of material from different crop processing activities or the same stage of crop processing but from different crop species. In both cases, this mixing of plant material suggests that these plant remains may have been used as fuel in this building.

A large number of the thirty-five samples from area E were from occupation surfaces although many of those samples contained few botanical remains. Two from area E were included in the statistical analysis. One sample, 72 (1010), part of the second early Byzantine occupation surface (1036), contained a very high proportion of weed to crop seeds, but also a large number of grape pips. A similar sample, 243 (1064), from a small pit cut into the same occupation surface (1036), contained a large number of grape pips and stalks. These samples were totally unlike the other samples from area E. Although the grapes' remains were not abundant enough to suggest wine making, it seems evident that significant amounts of grapes were either consumed in the vicinity or were deposited on the clay occupation surface, immediately inside the gate. The charring of the remains may have occurred during destruction. Due to the low number of botanical elements, little can be gleaned from the remaining samples from area E.

Four samples from area F were from contexts which have been interpreted as bread-ovens (Poulter 1995, 153). The samples produced relatively few plant remains, which is what would be expected from a bread-oven, since cereal grains used for bread would have been ground into flour. Crop species present in these samples, in very small amounts, included barley and bread wheat.

The majority of samples taken from area P were dated to this period. The different contexts from area P will be discussed separately since the sequence is singularly detailed. A total of nineteen samples which came from this area were dated to this period, 8 of which were included in the statistical analysis.

Only one sample from the pre-tower deposits in area P (*c* 450–600) was included in the statistical analysis, sample 552 (5051), and this was interpreted as a fine sieve by-product. The other samples from the pre-tower deposits produced few botanical remains.

Only one sample was taken from the floor of the tower in area P (*c* 450–600) and was included in the statistical analysis. This sample, 467 (5013), contained only weed seeds and was interpreted as a fine sieve by-product.

Of the six samples dated to the destruction of the tower in area P (*c* 600), one, sample 465 (5012), did not contain plant material. Sample 541 (5045) and sample 540 (5044) were interpreted as cleaned or semi-cleaned millet products. Either in the field or during processing, the millet in these samples was mixed with legumes, since seeds of the field bean are particularly numerous. Sample 542 (5042) was not attributable to a single crop processing activity; however it did contained a high proportion of field bean. Sample 551 (5047) was identified as a fine sieve by-product dominated by small, heavy weed seeds. The sample may indicate the processing of crop remains within the tower or the dumping of crop processing remains within it. Another sample from context 5042 (no sample number), which was dated too late to be included in the statistical analysis, contains only bitter vetch; this sample is undoubtedly a cleaned product.

Sample 460 (5009) was identified as an ash deposit possibly from a brazier used in cooking or

heating. This sample, dated to the 6th century, contained only one weed seed. Two samples, sample 461 (5008) and sample 538 (5037), were identified as make-up debris for the reoccupation of the tower. Sample 461 (5008) contained only weed seeds, dominated by SFH seeds: this sample was interpreted as a fine sieve by-product. Sample 538 (5037) was interpreted as another cleaned or semi-cleaned millet product mixed with legumes.

The three samples from area P which were identified as cleaned or semi-cleaned millet products also contained high proportions of legumes, particularly field bean, suggesting a mixing of these species. Four of the remaining five samples from area P included in the statistical analysis were identified as fine sieve by-products; the other contained a high proportion of field bean. Given that both products and by-products were found, and that most of these samples were associated with both millet and field bean, it is possible that crop processing of both millet and field been occurred in area P during this period.

Three out of the four samples from area R contained high proportions of weed seed remains, as well as a wide variety of crop species, especially lentil. This may again suggest the importance of pulses in this period. A high proportion of weed seeds came from sample 571 (5218), a make-up deposit for the primary floor of the tower. This sample was dated too late to be included in the statistical analysis, but, along with several species of cereals and pulses, it resembles fine sieve by-products and may indicate the dumping of crop processing by-products along with other material during the construction of the tower.

Two of the twelve samples from area S resembled crop processing by-products with high proportions of weed seeds, sample 567 (5281), from a levelling deposit laid immediately before the construction of the gate, and sample 548 (5261), from the destruction deposit which covered the final occupation surface within the gate-tower (Poulter 1995, 143). The remaining samples from area S contained very few plant remains. Although, in general, there were few plant remains from area S, a wide range of crop species were present; the secondary nature of the contexts does, however, limit interpretation.

Of the samples dated to the mid 5th to late 6th century at Nicopolis, many were from secondary deposits, which somewhat constrains interpretation. Samples of particular interest were those from area E which contained large amounts of grape pips and the samples from area P which show an increase in the amount of pulse species present, including bitter vetch, lentil and field bean. Of the samples included in the statistical analysis which could be identified as resulting from a single crop processing activity, four were interpreted as crop processing by-products and three were interpreted as millet cleaned or semi-cleaned products mixed with legumes. Perhaps millet and legumes were grown near or with each other, or perhaps both were processed in the same area. The samples from primary contexts in area P suggest that a limited range of crop species were present at Nicopolis at this time, and that millet and legumes were the most important.

The early 9th to early 11th centuries

Twelve samples were dated to this period and were from either the floor of the Slav grubenhaus in area F or from complete pots found standing *in situ* within the structure. The southernmost pots were covered by a roughly fired clay fireplace, typical of Slav ‘zemlyanki’ or ‘earth-dwellings’ (Poulter 1995, 167–8). Three of the pot samples, 410 (3152), 439 (3176) and 440 (3177), contained mostly millet grains and no weed seeds. Of the remaining pot samples, 411 (5153), 432 (3169), 434 (3171), 435 (3172) and 436 (3174) produced only millet grains, although in smaller amounts. Sample 411 (3153) came from an overturned pot and so a portion of its contents may have been lost. Samples 437 (3174) and 438 (3175) were the only pots to produce weed seeds, though the weeds were present in very small amounts. These samples seem to represent stored products burnt in the destruction of the grubenhaus by fire. Two samples from the floor surface of the structure, 428 (3151) and 429 (3151), also contained significant amounts of millet, together amounting to over 7,000 millet grains from that one context. These were probably spilled from one or more of the pots containing the stored grain.

The importance of millet to the Slav diet, particularly after their migration to the Lower Danube in

the 6th century is well documented. It was used to make a kind of porridge and, less commonly, for bread (Radeva 1986).

The post-medieval period, *c* 1750–1850

The forty-three samples dated to this period came from areas A, B, C, D, E, F, and P and include contexts such as robber-trenches following the curtain-wall foundations, late buildings, ditches, pits and dump deposits. Most of the rich samples came from pits and dump deposits, notably from areas C, D and P. The two most common species in these samples were millet and lentil. Other species present included bread wheat, rye, barley and grapes.

Towards an Understanding of Crop Husbandry Practices

Phytosociology

This section discusses the use of archaeological weed seeds in reconstructing crop husbandry practices, in particular the use of phytosociology. The Slav and post-medieval samples are largely excluded from this analysis and attention is concentrated on the samples dating to the Roman, late Roman and early Byzantine periods (2nd to early 7th centuries).

Phytosociology, pioneered and developed largely by Braun-Blanquet, recognises plant communities by their floristic composition and is concerned with the relationships between species and their environment (Jones 1992). Diagnostic species, those with narrow ecological tolerances, are used to organise ecological communities into a hierarchical system of classification. The association is the basic unit, with higher units including alliances, order and class.

A study of crop husbandry practices requires consideration of the ecological characteristics of the weed seeds. However, the present ecology of many weed species is variable and the stability of associations through time is uncertain. Since detailed local information is required to understand the individual lower units of phytosociology, this study will, instead, concentrate upon the higher classification unit of class. The character species of this unit are less specific in their requirements and are thus more widely applicable.

The work carried out by Ellenberg (1950, 1974), who was primarily concerned with Central Europe, will be used in the following study. Given the continental climate of northern Bulgaria, Ellenberg's conclusions should be broadly applicable to the site of Nicopolis. Also considered will be Ellenberg's edaphic factors, ph, moisture and nitrogen content of the soil.

Although different approaches to phytosociology employ a variety of systems for classifying ecological communities, all identify two major ecological groups, *Secalinetea* and *Chenopodietea*, which together comprise the segetal (crop) and ruderal (waste ground) communities. Here, these two groups are treated as classes (Ellenberg 1974), the *Secalinetea* and *Chenopodietea*, and are used as the primary basis on which to differentiate between different crop husbandry practices.

Methods of analysis

The weed taxa used in this study are those present in at least 10% of the forty-nine samples which contained thirty or more items. Of these taxa, only ten were identified to species level and consequently useful for this study. Furthermore, only eight of these species were classified by Ellenberg as character species, rather than merely companions, of a particular phytosociological class. These are as follows;

Secalinetea: Agrostemma githago, Sherardia arvensis and *Galium spurium*
Chenopodietea: Chenopodium album, Digitaria sanguinalis, Echinocloa crus-gali and *Setaria viridis.*
Phragmitetea (wet areas): *Galium palustre*

For each of the forty-nine larger samples, the ratio of *Chenopodietea* to *Secalinetea* character-species was calculated, using both the number of seeds and the number of species. In appendix 15.1 the ratios are expressed as the percentage of *Chenopodietea* character-species out of the two classes together. The first number is the percentage of *Chenopodietea* seeds and the second is the percentage of *Chenopodietea* species in the samples.

It is evident that the samples which were identified as fine sieve products contain mostly *Secalinetea* character-species. This probably occurred because *Secalinetea* character-species often exhibit qualities which mimic those of the grain. Consequently, they are particularly difficult to remove from cereal products and remain with the grains, often even after the later stages of cleaning (Bunting 1960, Jones 1992).

The samples from Nicopolis which were identified as mixed samples, possibly the mixing of fine sieve product and by-product, contain both *Secalinetea* and *Chenopodietea* character-species. This supports the deduction made above, that these samples derive from a variety of crop processing activities or from similar stages of crop processing but from crops exhibiting differences in grain size, such as bread wheat and millet.

In general, the *Secalinetea* character-species occur mostly in winter cereals and those of the *Chenopodietea* in spring-sown, garden or row crops, or waste ground. Since *Chenopodietea* character-species include both weeds of row crops and ruderal species their presence in the Nicopolis samples could be because of the methods of cultivation employed or may be due to contamination by species growing on waste ground (Jones 1992). This can be explained by looking at the groups of alliances within the *Chenopodietea* class. *Chenopodium muralis, Sisymbrion officinalis* and *Hodeion murini* are alliances characteristic of waste ground, whereas *Eragrostidion*, *Panico-Setarion* and *Polygono-Chenopodion polyspermi* are alliances typical of row-crops. The Nicopolis samples contain only character-species of row crop alliances (*Cynodon dactylon, Setaria viridis, Digitaria sanguinalis)* and none of the character-species associated with waste ground. This suggests that the abundance of the *Chenopodietea* character-species is not due to contamination by ruderals, but are rather weeds of crops.

Crop Husbandry at Nicopolis

Crops cultivated

From the 2nd to the 6th century, bread wheat, common millet, barley and rye seem to have been the most consistently abundant species present at Nicopolis and are the most likely to have been cultivated. The amount of bread wheat, barley and rye was slightly less in the samples dated to the early Byzantine period. Whether these crops were grown at or very close to Nicopolis it is impossible to say because it is likely that, throughout the occupation of the city, crop products were imported from its territory and perhaps from further afield. Rye and barley are consistently present together in samples predating the mid 5th century and may have been grown together as 'maslin' or mixed crops. This is know to have been a widespread practice in early modern times, and was used as an insurance against weather inimical to only one of the species (Halstead 1989). Practices such as this and growing a wide variety of crops would have minimized risks by protecting against bad years (Halstead and O'Shea 1989). Other species present include lentil and bitter vetch, with smaller amounts of other legumes including the common pea, field bean and grass pea. The field bean is most common in the samples dating from the mid 5th to 6th century and may indicate an increase in the consumption of pulses in this period.

Sowing times and tillage practice

As indicated above, the ratio of *Chenopodietea* to *Secalinetea* character-species in each of the larger forty-nine samples, expressing *Chenopodietea* character-species as a percentage of the two classes together, is presented in appendix 15.1. The two samples dated to the 2nd century, sample 403 (227) and 172 (265), both identified as fine sieve products, contained only *Secalinetea* character-species. The dominance of *Secalinetea* character-species may be explained by the high proportion of winter-sown crop grains in these samples. However, the most likely explanation for the dominance of *Secalinetea* character-species is that the size of the seeds is similar to that of the grains, and are thus difficult to remove from the crop. Without samples from this period identified as crop processing by-products, it is not possible to determine whether *Chenopodietea* character-species were present in the

crops prior to processing. Consequently, sowing times during the early occupation of Nicopolis can not be established.

Of the samples dated to the mid 2nd to mid 5th centuries, *Secalinetea* character-species again tended to dominate. Since many of these samples were interpreted as fine sieve by-products, the higher proportion of *Secalinetea* character-species is not solely explained by their size being similar to that of cereal grains. Their abundance could be explained by a dependence on winter-sown crop cultivation rather than on *Chenopodietea*-dominated, spring-sown or garden cultivated crops. This is an important consideration since most crops yield more heavily when winter-sown (Hillman 1981).

The samples dated from the mid 5th to 6th century however, may reflect a change in cultivation practices. Of the ten samples dated to this period, in terms of the number of seeds, eight are dominated by *Chenopodietea* character-species. Since several of these samples were interpreted as resulting from similar stages of crop processing as in the preceding period, this difference can not be explained as the result of different processing activities. Furthermore, since it has already been determined that the *Chenopodietea* character-species present in the Nicopolis samples most likely represent weeds of row crops rather than ruderal species, the abundance of *Chenopodietea* character-species suggests a difference in cultivation method between the mid 5th to 6th century and the earlier periods of occupation. The proportions of crop grains represented in the samples dated to the early Byzantine period is reduced, especially crops such as bread wheat, barley and rye. This evidence seems to suggest that there was a shift in emphasis after the mid 5th century in agricultural practices, away from dependence on winter-sown cultivation towards a practice based more on spring-sown or garden cultivation.

Several of the samples dated to the mid 5th to late 6th centuries in which *Chenopodietea* character-species were particularly high were associated with grape pips (samples 72 and 243), millet (samples 538, 540 and 541) and pulses (samples 540, 541 and 542). Since none of these samples were identified as stored products, and because of the small number of samples, it is impossible to draw any definite conclusions regarding the status of these species. However, it is possible that grapes, millet and pulses were associated with spring-sown or garden cultivation during this period.

Garden-type cultivation of crops present in the Nicopolis samples may be further supported by the fact that perennials and biennials are less common, annuals being the dominant weed type. Hillman (1981) has argued that the use of the mouldboard plough destroys many perennials and biennials by turning the soil over. While the use of the mouldboard plough in the Roman period is documented (White 1967), it is not known whether a plough was always used for cultivation. Perhaps garden cultivation, with digging, rigorous hoeing and weeding, has a similar effect on perennial and biennial species (Jones 1992).

Since the Slav and post-medieval samples contained so few weed seeds, it is not possible to determine whether crops in these periods were grown in fields or gardens, or were sown during the spring or winter.

Soil types

The dominant soil type upon which crops present in the Nicopolis samples were grown seems to have been fresh soils with intermediate to rich levels of nitrogen, indicated by the presence of species such as *Chenopodium album, Echinocloa crus-gali, Setaria viridis, Setaria verticillata, Sherardia arvensis, Galium spurium*. However, the characteristic habitats of three species (*Teucrium chamaedrys, Cynodon dactylon* and *Digitaria sanguinalis*) are dry, sandy soils and require intermediate to poor levels of nitrogen. It is likely that at least two different types of agricultural land were being cultivated, varying from fresh soil with intermediate to high levels of nitrogen to dry soil with lower nitrogen levels. The range of soil ph requirements for these species ranges from weakly acidic to slightly basic, suggesting that there was no significant difference in ph levels in the soil cultivated. The presence of *Galium palustre* in some samples indicates the proximity of wet areas, perhaps close to the river Rositsa. Unfortunately, since each of these soil types are present at or near Nicopolis, it is not possible to use soil types as a means of distinguishing between imported crops and those grown locally.

Vetren and Iatrus (Krivina)

Even though little work has been undertaken on the plant remains from Roman and late Roman sites on the lower Danube, it is still useful to compare the evidence from Nicopolis with the limited comparative material available in order to place the site within its regional context. Two other sites have provided comparative material to that found at Nicopolis; the Roman necropolis near the village of Vetren (near modern Sofia) and the site of Krivina, the Late Roman and early Byzantine fort of Iatrus on the Danube, north of Nicopolis (Fig 1.2).

The botanical remains from Krivina include a similar list of species to those from Nicopolis (Hajnalova 1982). The plant remains from the necropolis near Vetren were found in greater quantity and included material which was not found at either Nicopolis or Krivina such as fig, date, acorns, hazelnuts and pistachio (Popova 1986). However, the Vetren samples are from a grave context; such a variety of material may simply reflect the quantity and quality of offerings made to the deceased and may not be evidence for any significant difference in the diet between the occupants at Vetren and those at Nicopolis or Iatrus.

Conclusions

Tentative though the following conclusions are, botanical analysis suggests the presence of a wide range of domesticated crop species at Nicopolis during the Roman to early Byzantine periods. Statistical analysis allowed the identification of various crop processing activities and a greater understanding of the contexts from which the samples derived. Furthermore, additional weed seed analysis has led to tentative interpretations concerning the possible crop cultivation methods employed at or near Nicopolis.

The Roman period is best characterised by a dominance of a winter-sown agricultural regime, including bread wheat, barley and rye. This was probably supplemented by spring-sown crops such as millet. These crops may have been produced in the territory of Nicopolis, or they may have been imported from further afield. Statistical analysis was used to identify the presence of crop processing products and by-products.

The analysis of the early Byzantine samples suggests a shift in agricultural practice when compared to that of the Roman period. As in the Roman period, statistical analysis revealed that the final stages of crop processing of at least a portion of these crops took place on the site. The botanical remains from this period, while not as abundant as in the previous period, did reflect a greater range of species. The samples dated to the early Byzantine period contain higher proportions of weed seeds associated with spring or garden cultivation of crops. It is not clear whether one or the other, spring-sown or garden cultivation, or both occurred at this time. However, the absence of perennial and biennial weed seeds points to garden cultivation. In any case, the early Byzantine samples seem to indicate a dominance, not of winter-sown crops as in the Roman period, but of spring-sown and/or garden cultivation of a more varied group of species.

Given the limited research which has so far been carried out on the lower Danube on sites of similar dates to Nicopolis, the results here presented are inevitably tentative. When the results of the archaeobotanical analysis at Dichin are published, this will provide a valuable source of comparative material (above, pp. 12–14). However, it is to be hoped that future analysis of plant remains from other cities, villas and rural settlements will not only enhance our understanding of the results from Nicopolis, but will help to place the site within its regional context and allow the lower Danube to be usefully compared with other parts of the Roman and early Byzantine empires.

APPENDIX 15.1

The following appendix details the composition of the forty-nine samples used in the statistical analysis. The samples are listed in chronological order by period; within each period, the samples are organized by area, context number, and then sample number. The table is organized so that the pages alternate between the cultivated species and the wild species identified in each group of sixteen samples; this arrangement is replicated for all the forty-nine samples. The pages containing the list of cultivated species also contain statistical information pertaining to each sample. For analysis purposes, definite and cf. (those remains which, due to fragmentation and/or poor preservation, resemble that category more than any other) categories are considered together.

Key

Centuries:

2	= 2nd century
2–3	= Mid 2nd – mid 3rd century
3–4	= Mid 3rd – mid 4th century
4–5	= Early 4th – mid 5th century
5–7	= Mid 5th – late 6th century

BFH seeds = Big, free, heavy weed seeds
SFH seeds = Small, free, heavy weed seeds

Crop Processing Groups:

FSP	= Fine sieve product
WCBP	= Winnowing or coarse sieve by-product
MIL	= Cleaned or semi-cleaned miller product
FSBP	= Fine sieve by-product
MIL+	= Cleaned or semi-cleaned millet product with legumes

Cultivated Species

Century	2	2	2–3	2–3	2–3	2–3	2–3	2–3	2–3	2–3	3–4	3–4	3–4	3–4	3–4	3–4
Sample number	403	172	399	414	415	426	522	527	528	533	188	258	265	232	263	261
Area	A	B	D	D	D	D	P	P	P	P	B	B	B	B	B	B
Context number	2277	265	676	677	681	691	5024	5025	5027	5029	280	295	300	306	307	309
Density per litre	2.8	4.1	1.3	3.4	47.3	1.6	5	1.2	7.1	6	19.9	6.8	4	84.3	13.8	15
Triticum monococcum grains																
from 1-grained spikelets	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
from 2-grained spikelets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triticum spelta glume bases	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Triticum aestivum rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Triticum aestivum/durum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grains	35	10	2	16	1	1	2	1	-	-	40	10	5	4	10	18
Triticum indet grains	8	12	-	2	-	-	-	-	-	-	3	-	-	-	-	3
Triticum/Secale grains	6	-	3	8	-	-	-	-	-	-	23	9	8	2	3	9
Secale cereale																
rachis internodes	-	-	-	-	-	-	-	-	-	-	9	1	-	20	2	4
Grains	1	4	1	1	-	-	2	-	4	-	4	2	2	-	9	10
Secale/Hordeum rachis internodes	-	-	-	-	-	-	-	-	-	-	8	-	-	4	-	-
Hordeum																
6-row rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
indet rachis internodes	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-
hulled assymetric grains	2	-	-	-	-	-	-	-	1	-	2	-	-	-	2	-
hulled symmetric grains	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
hulled grains	4	-	1	5	-	2	2	-	6	-	29	2	1	-	6	4
indet grains	-	-	2	7	1	3	-	-	-	-	3	1	-	-	1	-
Triticum/Hordeum grains	-	-	-	1	-	5	-	-	-	-	4	-	-	-	-	-
Avena indet grains	3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Secale/Avena grains	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Cereal grains indet	-	5	-	9	-	-	-	1	4	-	26	3	3	8	10	7
Indet glume bases	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rachis internodes indet (free-threshing)	-	-	-	-	-	-	2	-	-	-	18	-	-	12	-	3

Table continued on next 10 pages

Century	2	2	2–3	2–3	2–3	2–3	2–3	2–3	2–3	2–3	3–4	3–4	3–4	3–4	3–4	3–4
Sample number	403	172	399	414	415	426	522	527	528	533	188	258	265	232	263	261
Cereal-size grass culm nodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Panicum miliacium grains	12	2	13	1	1	27	-	-	1	-	29	11	4	1	60	40
Pisum sativum	-	-	-	2	-	-	-	-	2	-	-	-	-	-	-	-
Vicia ervilia	-	1	-	-	-	-	-	-	2	1	1	2	1	-	5	3
Vicia faba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lathyrus sativus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lens culinaris	-	2	-	-	-	-	-	-	3	-	3	1	-	2	-	-
Large seeded legume indet	2	-	8	7	4	2	3	2	8	5	-	4	5	-	-	-
Juglans regia fragments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rubus sp.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
R. fruticosus agg.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prunus persica fragments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P. dulcis fragments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vitis sp.	-	-	1	1	2	-	-	-	1	-	-	-	1	-	2	2
Cornus mas	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
nutshell/stone fragments indet	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Total Number of Weed Seeds	1	2	25	71	324	10	100	31	108	51	32	3	7	1	13	16
Ratio of Weed:Cereal grains	1:74	0:20	<1:1	>1:1	46:1	1:4	10:1	10:1	>3:1	9:1	1:5	1:18	1:5	1:18	1:10	1:6
Ratio of Rachis:Cereal grains	-	-	-	-	-	-	1:3	-	-	-	1:4	1:27	-	3:1	1:14	1:7
BFH seeds	2	-	23	13	23	1	6	3	26	5	35	2	3	-	8	8
SFH seeds	1	-	1	31	256	6	58	18	52	24	3	1	1	1	1	8
Chenopodietea:Secalinetea (as %; Seeds)	0	0	0	71.4	54.2	-	33.3	28.6	10.5	40	0	-	0	-	0	11.1
Chenopodietea:Secalinetea (as %; Species)	0	0	0	50	60	-	25	33.3	50	66.7	0	-	0	-	0	25
Crop Processing Group	FSP	FSP	-	FSBP	FSBP	MIL	FSBP	FSBP	FSBP	FSBP	-	-	-	WCBP	-	-

Wild Species:

Century	2	2	2–3	2–3	2–3	2–3	2–3	2–3	2–3	2–3	3–4	3–4	3–4	3–4	3–4	3–4
Sample number	403	172	399	414	415	426	522	527	528	533	188	258	265	232	263	261
Area	A	B	D	D	D	D	P	P	P	P	B	B	B	B	B	B
Context number	2277	265	676	677	681	691	5024	5025	5027	5029	280	295	300	306	307	309
Polygonum aviculare agg.	-	-	-	-	6	-	1	-	-	-	-	-	-	-	-	-
P. persicaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bilderdykia convolvulus	-	-	-	1	9	-	-	-	-	-	1	1	1	-	-	1
Rumex sp.	-	-	-	-	1	1	-	-	3	1	-	-	-	-	1	4
POLYGONACEAE	-	-	-	2	16	-	4	-	3	4	-	-	-	-	-	-
Chenopodium hybridum	-	-	-	-	-	1	-	-	-	-	1	1	-	-	-	-
C. album-type	-	-	-	7	3	-	2	2	1	1	-	-	-	-	-	-
Atriplex sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chenopodium/Atriplex sp.	-	-	-	3	29	-	6	-	1	-	1	-	-	-	-	1
Portulaca oleraceae	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Agrostemma githago	1	-	4	2	2	-	1	-	7	-	1	-	-	-	3	4
Silene sp.	-	-	-	-	1	-	1	-	-	-	5	-	-	-	-	-
CARYOPHYLLACEAE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ranunculus sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Papaver sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brassica/Sinapis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agrimonia sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potentilla sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trigonella sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LEGUMINOSAE	-	1	-	3	29	-	12	6	26	12	-	-	1	1	-	-
Malva sylvestris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MALVACEAE	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-
Cistus incanu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peucedanum sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UMBELLIFEREAE	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2	-
Sherardia arvensis	-	-	-	1	-	-	2	2	-	-	1	-	-	-	-	1
Sherardia sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Galium palustre	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-

Century	2	2	2–3	2–3	2–3	2–3	2–3	2–3	2–3	2–3	3–4	3–4	3–4	3–4	3–4	3–4
Sample number	403	172	399	414	415	426	522	527	528	533	188	258	265	232	263	261
G. spurium	-	-	1	2	9	-	1	3	10	3	3	-	1	-	3	3
G. aparine	-	-	13	5	1	1	1	-	1	-	-	-	-	-	-	-
G. spurium/aparine	-	-	5	3	-	-	3	-	8	2	-	-	-	-	-	-
small Galium/Asperula sp.	-	-	-	-	-	-	12	-	3	1	-	-	-	-	-	-
Galium /Asperula sp.	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Convolvulus arvensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LABIATAE	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Ajuga sp.	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-
Teucrium chamaedrys	-	-	-	4	3	5	2	-	-	-	1	-	-	-	-	-
Teucrium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solanum nigrum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solanum sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sesamum indicum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plantago lanceolata-type	-	-	-	-	-	-	-	1	5	-	-	-	-	-	-	-
Plantago sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sambucus sp.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-
Valerianella sp.	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Scabiosa sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthemis sp.	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
COMPOSITAE	-	-	-	-	1	2	5	-	2	-	-	-	-	-	-	-
Lapsana communis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lolium sp.	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-
Bromus sterilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromus sp.	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Cynodon dactylon	-	-	-	6	14	-	12	2	4	4	2	-	-	-	-	-
Echinocloa crus-gali	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Digitaria sanguinalis	-	-	-	3	6	-	-	-	-	-	-	-	-	-	-	-
Setaria verticillata/viridis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Echinocloa crus-gali/Setaria sp.	-	-	-	-	4	-	-	-	2	-	-	-	-	-	-	1
GRAMINEAE	-	-	-	2	5	-	2	1	3	-	2	1	-	-	-	-
Carex sp.	-	-	-	-	3	-	4	-	3	-	-	-	-	-	-	-
POLYGONACEAE/CYPERACEAE	-	-	-	1	136	-	-	5	-	-	1	-	-	-	-	1
Indet. Sp.	-	1	-	20	28	-	29	9	25	23	12	-	2	-	2	-

Cultivated Species

Century	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	4–5	4–5	4–5	4–5
Sample number	225	256	257	229	260	274	310	303	304	517	497	503	419	421	313	276
Area	B	B	B	B	B	B	B	B	B	M	P	P	C	C	D	D
Context number	310	312	317	329	333	335	337	339	339	4866	5021	5022	4057	4060	541	584
Density per litre	20	5.8	5.5	34	20.4	7.4	21.1	3.5	10.1	1.6	1.5	2.2	0.7	1	5.2	5.5
Triticum monococcum grains																
from 1-grained spikelets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
from 2-grained spikelets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triticum spelta glume bases	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Triticum aestivum rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triticum aestivum/durum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grains	25	12	18	-	6	6	11	4	3	-	-	7	-	-	12	4
Triticum indet grains	1	10	-	7	3	-	-	-	-	-	-	-	-	1	-	-
Triticum/Secale grains	35	3	9	10	8	-	14	3	12	-	-	4	1	1	-	-
Secale cereale																
rachis internodes	1	-	-	2	48	1	-	-	1	-	-	-	-	-	-	-
Grains	14	2	5	2	5	1	8	2	5	-	-	-	1	-	-	-
Secale/Hordeum rachis internodes	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Hordeum																
6-row rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indet rachis internodes	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
hulled assymmetric grains	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
hulled symmetric grains	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
hulled grains	6	4	2	2	8	3	8	-	4	1	-	4	1	1	14	1
indet grains	2	-	-	-	4	1	1	2	-	-	1	-	-	-	2	-
Triticum/Hordeum grains	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avena indet grains	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Secale/Avena grains	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cereal grains indet	5	6	-	2	4	3	5	4	-	-	-	3	1	2	2	6
Indet glume bases	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rachis internodes indet (free-threshing)	-	-	-	3	24	-	-	-	-	-	-	-	-	-	-	-

Wild Species:

Century	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	4–5	4–5	4–5	4–5
Sample number	225	256	257	229	260	274	310	303	304	517	497	503	419	421	313	276
Area	B	B	B	B	B	B	B	B	B	M	P	P	C	C	D	D
Context number	310	312	317	329	333	335	337	339	339	4866	5021	5022	4057	4060	541	584
Polygonum aviculare agg.	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
P. persicaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bilderdykia convolvulus	1	-	-	-	-	-	2	-	1	-	-	-	-	1	1	1
Rumex sp.	8	-	-	1	2	-	1	-	-	-	-	2	-	-	-	1
POLYGONACEAE	5	-	-	-	1	2	2	-	-	2	-	1	-	-	-	-
Chenopodium hybridum	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
C. album-type	2	-	1	-	2	-	-	1	-	4	1	-	2	1	-	-
Atriplex sp.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chenopodium/Atriplex sp.	-	1	-	-	-	1	2	-	-	-	4	2	-	-	-	1
Portulaca oleraceae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agrostemma githago	10	1	-	-	1	1	3	-	1	-	1	2	-	-	-	1
Silene sp.	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-
CARYOPHYLLACEAE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Ranunculus sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Papaver sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brassica/Sinapis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agrimonia sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potentilla sp.	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Trigonella sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LEGUMINOSAE	1	2	-	-	2	3	-	-	-	17	7	9	4	7	2	6
Malva sylvestris	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
MALVACEAE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cistus incanu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peucedanum sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UMBELLIFEREAE	-	-	1	-	2	-	-	1	1	-	-	-	-	1	-	1
Sherardia arvensis	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	-
Sherardia sp.	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Galium palustre	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1
G. spurium	5	-	1	-	2	-	2	-	2	-	4	6	-	1	3	3

Century	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	3–4	4–5	4–5	4–5	4–5
Sample number	225	256	257	229	260	274	310	303	304	517	497	503	419	421	313	276
G. aparine	1	1	-	-	-	1	-	-	-	-	1	1	-	-	-	-
G. spurium/aparine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
small Galium/Asperula sp.	-	-	-	-	2	-	-	-	-	3	8	5	-	-	-	-
Galium /Asperula sp.	1	-	-	-	-	-	-	-	-	-	2	4	-	-	-	3
Convolvulus arvensis	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
LABIATAE	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Ajuga sp.	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Teucrium chamaedrys	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	3
Teucrium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solanum nigrum	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Solanum sp.	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Sesamum indicum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plantago lanceolata-type	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Plantago sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Sambucus sp.	1	-	-	1	3	-	-	-	1	-	-	-	-	-	-	-
Valerianella sp.	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Scabiosa sp.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthemis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPOSITAE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lapsana communis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lolium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromus sterilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromus sp.	-	-	-	-	2	-	-	-	-	-	-	-	-	2	-	-
Cynodon dactylon	1	-	-	-	-	-	-	-	-	-	5	2	1	4	-	-
Echinocloa crus-gali	-	-	-	-	12	-	-	-	-	-	1	-	-	-	-	-
Digitaria sanguinalis	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Setaria verticillata/viridis	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-
Echinocloa crus-gali/Setaria sp.	1	-	-	-	5	-	-	-	-	-	-	-	-	2	-	-
GRAMINEAE	-	-	-	1	5	-	2	-	1	-	2	1	-	3	1	2
Carex sp.	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
POLYGONACEAE/CYPERACEAE	-	-	1	-	-	-	-	-	-	1	-	-	1	4	-	1
Indet. Sp.	5	3	2	1	10	4	4	-	1	1	14	17	12	8	8	14

Cultivated Species

Century	4–5	4–5	4–5	4–5	4–5	4–5	4–5	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7
Sample number	277	422	458	463	466	523	531	72	243	461	467	538	542	540	541	551	552
Area	D	D	E	E	E	M	M	E	E	P	P	P	P	P	P	P	P
Context number	588	689	1190	1192	1194	4869	4871	1010	1064	5008	5013	5037	5042	5044	5045	5047	5051
Density per litre	4.6	2.6	4.4	10.9	2.3	2.6	5.1	6.7	5.3	19.8	1.6	1	2.1	8.3	5	7.2	1
Triticum monococcum grains																	
from 1–grained spikelets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
from 2–grained spikelets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triticum spelta glume bases	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triticum aestivum rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triticum aestivum/durum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
grains	6	-	-	10	8	5	2	-	-	-	-	-	-	-	-	-	2
Triticum indet grains	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Triticum/Secale grains	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	
Secale cereale																	
rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
grains	1	1	-	17	-	3	-	-	-	-	-	-	2	-	-	-	
Secale/Hordeum rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hordeum																	
6–row rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indet rachis internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
hulled assymetric grains	-	-	-	5	-	-	1	-	-	-	-	1	-	-	-	-	1
hulled symmetric grains	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
hulled grains	7	-	2	17	7	2	3	-	-	-	-	-	-	-	1	-	2
indet grains	1	-	-	20	13	-	1	-	-	-	-	-	-	-	-	-	1
Triticum/Hordeum grains	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avena indet grains	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Secale/Avena grains	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cereal grains indet	6	-	1	20	8	8	2	-	1	-	-	-	-	-	-	-	1
Indet glume bases	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Century	4–5	4–5	4–5	4–5	4–5	4–5	4–5	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7
Sample number	277	422	458	463	466	523	531	72	243	461	467	538	542	540	541	551	552
Rachis internodes indet (free-threshing)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Cereal-size grass culm nodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Panicum miliacium grains	8	1	10	8	4	7	-	1	3	-	-	12	-	9	14	-	2
Pisum sativum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vicia ervilia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vicia faba	-	-	-	2	-	-	-	-	-	-	-	4	16	14	14	-	-
Lathyrus sativus	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Lens culinaris	-	2	-	7	1	2	-	-	-	-	-	-	-	-	-	-	-
Large seeded legume indet	5	-	-	9	-	-	1	-	-	-	-	4	2	2	1	-	-
Juglans regia fragments	-	-	-	18	-	-	-	3	2	-	-	-	-	-	-	-	-
Rubus sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R. fruticosus agg.	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Prunus persica fragments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P. dulcis fragments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vitis sp.	-	-	-	2	5	6	1	162	151(38)	-	-	1	2	-	-	1	-
Cornus mas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
nutshell/stone fragments indet	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	-
Total Number of Weed Seeds	7	27	22	179	33	44	40	59	10	62	17	8	7	8	5	41	22
Ratio of Weed:Cereal grains	1:5	7:1	2:1	>1:1	<1:1	3:1	4:1	51:1	5:3	62:0	77:0	1:3	<1:1	1:3	1:6	41:1	2:1
Ratio of Rachis:Cereal grains	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1:6
BFH seeds	4	-	19	126	4	19	2	8	5	2	2	-	3	-	1	-	2
SFH seeds	2	16	3	12	22	21	28	39	4	48	13	2	2	4	3	23	11
Chenopodietea:Secalinetea (as %; Seeds)	0	100	0	0	100	16.7	33.3	96.6	75	92	60	25	66.7	100	100	100	50
Chenopodietea:Secalinetea (as %; Species)	0	100	0	0	100	50	33.3	66.7	50	50	50	33.3	50	100	100	100	50
Crop Procesing Group	-	FSBP	-	-	FSBP	-	FSBP	-	-	FSBP	FSBP	MIL+	-	MIL+	MIL+	FSBP	FSBP

Wild Species:

Century	4–5	4–5	4–5	4–5	4–5	4–5	4–5	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7
Sample number	277	422	458	463	466	523	531	72	243	461	467	538	542	540	541	551	552
Area	D	D	E	E	E	M	M	E	E	P	P	P	P	P	P	P	P
Context number	588	689	1190	1192	1194	4869	4871	1010	1064	5008	5013	5037	5042	5044	5045	5047	5051
Polygonum aviculare agg.	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-
P. persicaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bilderdykia convolvulus	-	-	-	3	-	1	-	1	3	-	-	-	-	-	-	-	-
Rumex sp.	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-
POLYGONACEAE	-	-	-	1	-	1	3	-	-	1	-	-	-	-	-	-	-
Chenopodium hybridum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. album-type	-	3	-	-	7	2	-	1	-	1	-	2	2	5	1	1	-
Atriplex sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chenopodium/Atriplex sp.	-	1	1	1	8	3	2	1	1	1	1	-	-	-	2	4	2
Portulaca oleraceae	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agrostemma githago	1	-	2	7	-	11	1	-	-	1	1	-	1	-	-	-	-
Silene sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1
CARYOPHYLLACEAE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ranunculus sp.	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Papaver sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brassica/Sinapis sp.	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Agrimonia sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potentilla sp.	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Trigonella sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LEGUMINOSAE	-	6	1	2	3	10	9	6	-	-	5	-	-	-	-	12	4
Malva sylvestris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MALVACEAE	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Cistus incanu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peucedanum sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UMBELLIFEREAE	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Sherardia arvensis	-	-	-	1	-	-	1	-	-	2	-	-	-	-	-	-	-
Sherardia sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Galium palustre	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G. spurium	-	-	4	43	-	4	-	1	1	1	1	-	2	-	-	-	2

Century	4–5	4–5	4–5	4–5	4–5	4–5	4–5	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7	5–7
Sample number	277	422	458	463	466	523	531	72	243	461	467	538	542	540	541	551	552
G. aparine	1	-	8	41	2	-	-	-	-	-	-	-	-	-	1	-	-
G. spurium/aparine	-	-	-	18	-	3	1	-	-	-	-	-	-	-	-	-	-
small Galium/Asperula sp.	-	1	-	-	-	2	7	-	-	-	-	-	-	-	-	-	-
Galium /Asperula sp.	2	-	5	13	1	-	-	-	1	-	-	-	-	-	-	-	-
Convolvulus arvensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LABIATAE	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Ajuga sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Teucrium chamaedrys	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Teucrium sp.	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Solanum nigrum	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Solanum sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sesamum indicum	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Plantago lanceolata-type	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Plantago sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sambucus sp.	-	-	-	1	1	-	-	6	-	1	-	-	-	-	-	-	-
Valerianella sp.	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Scabiosa sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthemis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPOSITAE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lapsana communis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lolium sp.	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromus sterilis	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromus sp.	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Cynodon dactylon	-	1	-	-	1	1	4	-	-	-	-	-	-	-	-	-	1
Echinocloa crus-gali	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Digitaria sanguinalis	-	-	-	-	-	-	-	27	-	42	2	-	-	2	-	-	-
Setaria verticillata/viridis	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Echinocloa crus-gali/Setaria sp.	-	1	-	-	1	1	1	-	3	2	1	-	-	-	-	-	-
GRAMINEAE	-	-	-	3	1	-	1	1	1	1	-	5	-	1	1	-	2
Carex sp.	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	1	-
POLYGONACEAE/CYPERACEAE	2	3	-	7	-	-	-	1	-	-	2	-	-	-	-	-	3
Indet. Sp.	1	8	-	26	5	4	9	6	-	7	1	1	2	-	-	18	7

THE MOLLUSCA

by

Mark J. Beech

Introduction

Analysis of the mollusca from Nicopolis was undertaken in order to recover information about the environmental conditions prevailing in and around the ancient city.
The primary questions were:

(1) What were the prevailing environmental conditions within the city and its immediate vicinity?
(2) Do the molluscs provide any information about the nature of activities taking place on the site?
(3) Was there any evidence for the importation of marine mollusca?

This report is based upon field notes written by Bob Alvey (formerly the Technician in the Department of Archaeology, University of Nottingham) and also upon an undergraduate project carried out by Rachel Tassell (a 3rd year Zoology graduate at the University of Nottingham).

Methods

The mollusca were retrieved using three methods: hand collection, on-site dry sieving using 0.5cm mesh, and from the residues produced by the flotation programme (see above, p. 154).

Preliminary sorting and analysis of the molluscan assemblage was carried out by Bob Alvey. The molluscan assemblage was identified by Alvey using his own reference collection and the following published sources: Evans 1972, Kerney and Cameron 1979, Kerney *et al* 1983 and Lozek 1964.

Results

LAND MOLLUSCA

The following list of land mollusca was recorded from the samples processed:

Argna truncatella (Pfeiffer, 1841)
Carychium minimum (Müller, 1774)
Carychium tridentatum (Risso, 1826)
Ceciliodes acicula (Müller, 1774)
Cepaea vindobonensis (Férussac, 1821)
Chondrula tridens (Müller, 1774)
Cochlicopa lubricella (Porro, 1838)
Faustina trizona balcanica (Kobelt, 1876)
Helicella candicans (Pfeiffer, 1841)
Helicella derbentina (Krynicki, 1836)
Helicella spp.
Helix pomatia (Linnaeus, 1758)
Lacinaria plicata Draparnaud, 1801
Lacinaria (*Bulgarica*) *varnensis* (Pfeiffer, 1848)
Lindholmiola corcyrensis (Deshayes, 1839)
Oxychilus spp.
Pupilla muscorum (Linnaeus, 1758)
Succinea oblonga Draparnaud, 1801
Truncatellina cyclindrica (Férussac, 1807)
Vallonia enniensis (Gredler, 1856)
Vallonia excentrica Sterki, 1893
Vallonia pulchella (Müller, 1774)
Vertigo pygmaea (Draparnaud, 1801)
Vitrea contracta (Westerlund, 1871)
Zebrina detrita (Müller, 1774)
Zonitoides nitidus (Müller, 1774)

FRESHWATER MOLLUSCA

In addition to the land mollusca, a considerable number of freshwater molluscs was recovered during the excavations. Species include:

Fagotia esperi (Férussac, 1823)
Fagotia acicularis (Férussac, 1823)
Gyraulus albus (Müller, 1774)
Planorbis planorbis (Linnaeus, 1758)
Planorbis corneus (Linnaeus, 1758)
Theodoxus danubialis (Pfeiffer, 1828)
Theodoxus transversalis (Pfeiffer, 1828)
Unio crassus Philipsson, 1788

MARINE MOLLUSCA

At least 9 species of marine mollusca were identified. These included the following species:

Bittium reticulatum (da Costa, 1778) – Needle shell
Cardium spp. – Cockles
Flexopecten glaber (Linnaeus, 1758) – Scallop
Glycymeris violascens (Lamarck, 1819) – Cockle
Mytilus galloprovincialis (Lamarck, 1819) – Mussel
Nucula nucleus (Linnaeus, 1758) – Common Nut shell
Ostrea edulis (Linnaeus, 1758) – Oyster
Patella coerulea (Linnaeus, 1758) – Limpet
Truncularioposis trunculus (Linnaeus, 1758) – Murex

A list of the major deposits of marine mollusca at Nicopolis is presented in Appendix 16.1. There were comparatively few locations where *in situ* fills provided a good sequence of deposits laid down over a long period of time. By far the most important was a wide ditch cut across the Roman road in area B. It silted up gradually before it was finally filled in and sealed by cobble spreads reinstating the roadway in the 4th century.

The Terrestrial Molluscan sequence in Area B

A series of terrestrial molluscan samples from the 3rd century ditch cutting the road in area B (Poulter 1995, 71–3) was studied by Tassell. The earliest levels in this ditch can be dated to *c* 175–250. Later fills, dated to the period *c* 250–275, included domestic waste and wind blown natural buildup. The final backfill of the ditch occurred at the end of the third or during the first half of the fourth century.

Samples were collected from the successive fills within the ditch. Identifications were then made by Alvey and Tassel. Calculations as to the total number of shells in each sample were carried out by Tassell, excluding non-apical fragments and the burrowing species *Ceciliodes acicula*. The fragmentary nature of many of the shells meant that it was difficult in many cases to identify them to species. Shells belonging to the genera *Helicella*, *Oxychilus*, *Helix* and *Chondrula* were all noted. In the case of the latter two genera these were not included in percentage abundance calculations because they were poorly preserved and no apical fragments being present.

Identification of the preferred local habitats/conditions of present day mollusc species was made with reference to Kerney and Cameron 1979, Evans 1972, Boycott 1934, Ellis 1969, Beedham 1972, Lozek 1964, Likharev and Rammelmeier 1962. They agree that all members of the genus Helicella prefer dry open and often exposed areas. Most members of the genus *Oxychilus* prefer shady, damp areas. However, some species are more catholic than others; *Oxychilus alliarius* exists quite happily in more open areas (Likharev and Rammelmeier 1962).

In the earliest levels of the ditch in area B, relatively few species were present. Members of the genus *Helicella* are the only ones in abundance, accounting for 73.3% of the terrestrial molluscan fauna in this sample (Fig 16.1). The xerophilous nature of this genus in Bulgaria, coupled with the presence of the highly xerophilous mollusc *Truncatellina cylindrica*, which constituted 13% of the total sample, suggests a local habitat which is predominantly open and dry. The only shade-loving molluscs present in this early assemblage is the genus *Oxychilus*, which only accounts for 4.3% of the total assemblage. The presence of a small proportion of hygrophilous species, ie, *Carychium minimum* (4.3%) and *Succinea oblonga* (4.3%), indicate, however, that conditions were not completely dry and that areas with a wetter habitat also existed close by. The species *Succinea oblonga* is normally a true marsh species, found only in marshes and along river banks.

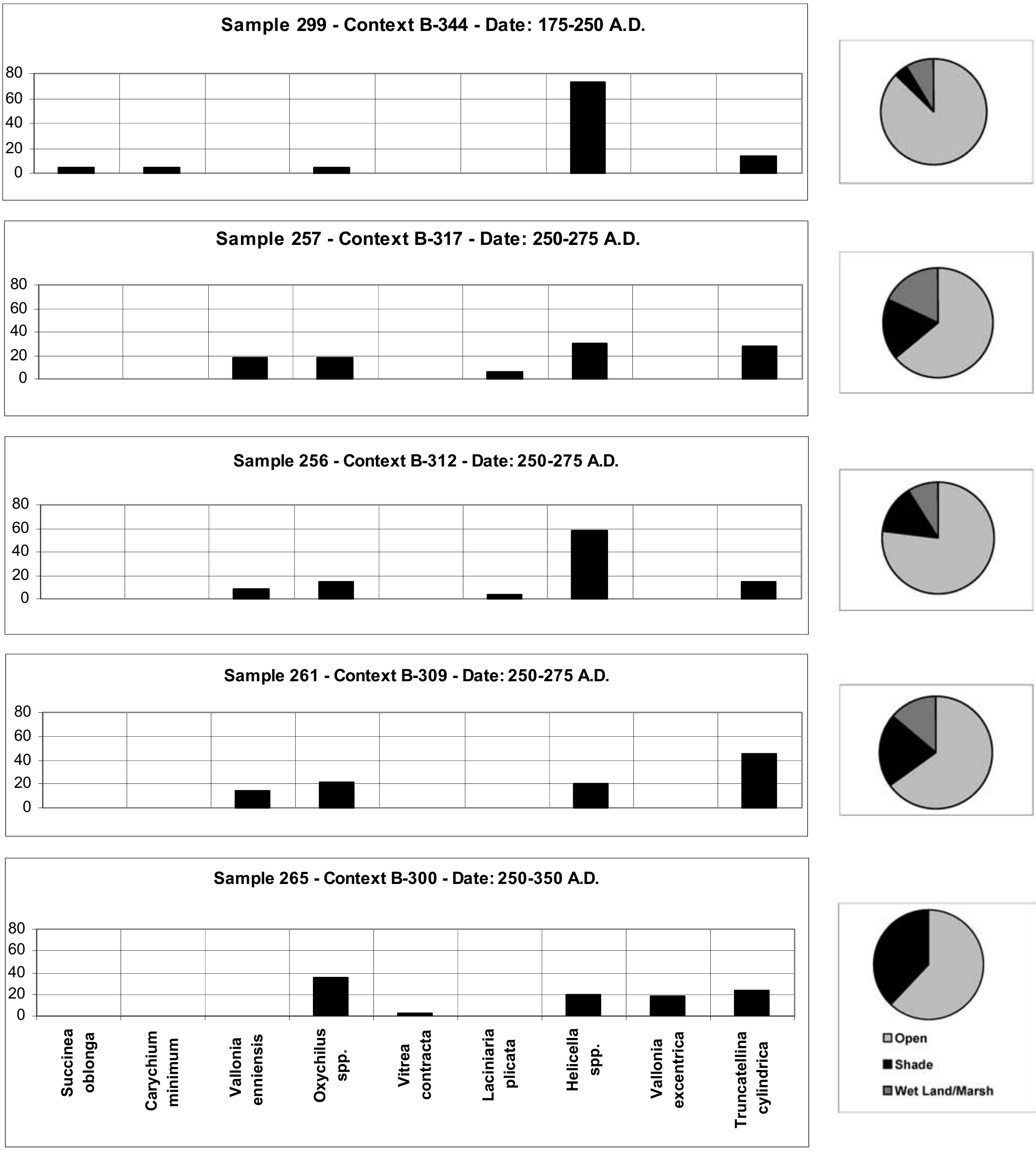


Fig 16.1 Frequency of major molluscan species present in samples studied from Area B. Pie charts represent habitat summary for each sample

By 250 it seems probable that much of the local area around Nicopolis was open grasslands with isolated trees or shrubs. Wetter marshlands were also not far away, no doubt existing along the river Rositsa, immediately south of the site.

The later samples also comprised relatively few species. There was a slight reduction, however, in the percentage of species favouring open habitats, although they still formed the larger proportion of each sample. The apparent increase in the essentially woodland species *Oxychilus* may suggest greater tree cover. However, there are still some more catholic members of this genus present such as *Oxychilus alliarius*. Shelter and shade still seems to be limited between *c* 175 and 350.

The presence of hygrophilous species like *Vallonia enniensis* until at least 275 and, in particular, the presence of *Laciniaria plicata* is significant since the latter, although preferring open habitats, favours damper conditions than the species found in the primary fills. This suggests that wetlands such as marshy areas continued to exist in the vicinity, along with drier exposed grasslands until at least the latter part of the third century.

A number of the molluscs found in two of the samples, B 312 (250–275) and B 300 (250–350) were blue in colour. This appeared to have been caused by exposure to fire. The phenomenon of burnt molluscs was not unique to the ditch in area B. It seems that, between *c* 250 and 350, flash fires occurred regularly on the site.

Discussion

A range of general habitats is indicated by the land mollusc species present. Many of those recorded prefer dry, open grassland conditions, eg, *Vertigo pygmaea*, *Pupilla muscorum* and *Vallonia pulchella*. Although this latter species prefers open calcareous habitats, it can also be found in slightly damper localities. A further example of a dry, open grassland-type species is a specimen of *Zebrina detrita*, found encased in the matrix of a Roman mudbrick. Damp-loving species, eg, *Succinea oblonga* and *Carychium minimum*, were found in abundance at the foot of the steep slope on the southern side of the site, where a number of springs exist today. It is possible that they found their way up to the site with drinking water or with water used in mixing lime plaster.

The freshwater molluscs could well have come from the Rositsa. It is possible that, in Roman times, its course was much closer to the site than it is today. A surprising find from a soil sample taken from the road surface in area C was a single valve of an Ostracoda. These are found in abundance in the springs on the southern side of the site. *Unio crassus*, another freshwater species, was no doubt used as food during the Roman period. It was found in 6th century contexts. Other freshwater species would have come to the site along with sand taken from the river and used in the construction of buildings, as in the provision of bedding for the floor tiles in the basilicas (Poulter 1995, 158). One freshwater mollusc was found embedded in the fabric of a potsherd, again perhaps suggesting activity by the river; the river gravels were probably used as tempering material in pottery manufacture.

The presence of marine mollusca indicates some connection with coastal areas, presumably along the Black Sea. The needle shell (*Bittium reticulatum*) is a small narrow example. It is typically found along the shore line in shallow water on rocky or soft bottomed habitats. Cockles (*Cardium* spp.) are found in soft substrates such as sand or mud, where they burrow into the sea floor. Scallops (*Flexopecten glaber*) inhabit various types of sea beds. The cockle (*Glycymeris violascens*) typically burrows just below the surface in mud and sand. Mussels (*Mytilus galloprovincialis*) attach to rocks and stones on the shore and in shallow water. The common nut-shell (*Nucula nucleus*) lives in offshore habitats in gravel, muddy or coarse sand bottoms. Oysters (*Ostrea edulis*) similarly belong in offshore habitats from low water to around 50 fathoms, typically inhabiting firm, immobile substrates. Limpets (*Patella coerulea*) firmly attach themselves to rocks in coastal habitats. The murex shell (*Truncularioppsis trunculus*) inhabits stones and rocks in the upper littoral zone. Some of these marine shells may have arrived by chance in barrels containing luxury imports, such as large oysters (Poulter 1995, 176).

Conclusions

A detailed examination of the condition of the mollusca reveals that many of the smaller specimens exhibited considerable wear and abrasion, and even a slight blueing to the tops of some of the shells. This may be due to strong winds promoting flash fires. Such a fire was seen in 1988 when it quickly spread across the site, but giving off only small amounts of heat, and so did not destroy the shells altogether. Such fires appear to have been as common in Antiquity as they are today. Indeed, the general environmental conditions would seem to have been similar to the present time with largely dry, open, calcareous grassland, albeit with some small wetter marshy areas close by.

As would be expected, the molluscs found suggest that water was brought up from the river and was

used for drinking or the mixing of lime plaster. Bedding sand was taken from the river and used in the two basilica floors. Possibly, river gravel was used as a tempering material in the local manufacture of pottery.

The range of marine mollusca recorded at the site demonstrates that regular contact was maintained with coastal areas, presumably on the Black Sea, although wider contacts with the Mediterranean can not be excluded. Although the needle shell (*Bittium reticulatum*) and common nut-shell (*Nucula nucleus*) might be considered to be too small for eating, the other molluscs such as the oyster (*Ostrea edulis*), mussel (*Mytilus galloprovincialis*), cockle (*Cardium* spp.), limpet (*Patella coerulea*), scallop (*Flexopecten glaber*) and cockle (*Glycymeris violascens*), would have all been eaten by the inhabitants of Nicopolis. The presence of the murex shell (*Truncalariopsis trunculus*) may be associated with the manufacture of purple dye, but it could also have been used as food. As the sizes of some of the Nicopolis molluscs are on the small to very small size, we may be looking at the residues from whatever containers were used to bring them to the site. Discarded shells, not suitable for sale, may have formed the residue at the bottom of large containers used to import delicacies such as oysters. Such an activity, on the south side of the town, close to the presumed site of the harbour, might well explain the nature of these waste deposits (Poulter 1995, 176).

In general, however, only small quantities of marine molluscs were found. In contrast, considerable quantities of local freshwater mussels (*Unio crassus*) were found in nearly all the major archaeological deposits across the site. This suggests that the inhabitants regularly exploited the local resources available in the river Rositsa. These mussels are indeed still eaten today in the nearby village of Nikiup.

APPENDIX 16.1

List of occurrences of major deposits of marine mollusca at Nicopolis.

Species	**Area**	**Context**	**Description / Comments**	**Date**
Cockles (Cardium spp.)	F	3344	silty clay, pot, bone, dump	400–450
Cockle (*Glycymeris violascens)*	C	5311	charcoal, silty clay, backfill of early ditch (5316)	250–350
Common nut-shell (*Nucula nucleus)*	C	4031	possible occupation surface – Byzantine	?
Limpet (*Patella coerulea*)	F	3344	silty clay, pot, bone = dump	400–450
Murex (*Truncalariopsis trunculus*)	F	3151	ashy destruction of slav grubenhaus	800–1000
Mussel (*Mytilus galloprovincialis*)	A	2277	fill of pit(2268) – domestic rubbish	100–130
Mussel (*Mytilus galloprovincialis*)	B	238	fill of small pit/post-hole	100–350
Mussel (*Mytilus galloprovincialis*)	P	5024	pit, ash, fnds., dump	150–250
Mussel (*Mytilus galloprovincialis*)	K	4515	Dump	250–450
Mussel (*Mytilus galloprovincialis*)	K	4516	Dump	250–450
Mussel (*Mytilus galloprovincialis*)	D	604	clay,charcoal,destruction deposit at end of ‘early building’	350–450
Mussel (*Mytilus galloprovincialis*)	M	4846	fill of pit (4847), fnds, pot, bone = dump	350–450
Mussel (*Mytilus galloprovincialis*)	P	5018	Make-up deposit for tower	450
Mussel (*Mytilus galloprovincialis*)	P	5050	finds, pot, glass dump	450
Mussel (*Mytilus galloprovincialis*)	P	5051	make-up for tower, same as above 5018	450
Mussel (*Mytilus galloprovincialis*)	D	636	clay,charcoal, destruction deposit of ‘early building’ west end of build. above at east end of the same	450–600
Needle Shell (*Bittium reticulatum*)	S	5261	Byzantine destruction deposit	450–600
Oyster (*Ostrea edulis*)	C	4127	cut of early rectangular pit	150–175
Oyster (*Ostrea edulis*)	K	4509	make-up for floor of building	250–450
Oyster (*Ostrea edulis*)	K	4516	same deposit as 4515	250–450
Oyster (*Ostrea edulis*)	K	4515	ashy dump deposit	350–450
Oyster (*Ostrea edulis*)	F	3367	rubble roadway	400–450
Scallop (*Flexopecten glaber*)	A	-	Unstratified	?

17

THE METALLURGICAL DEBRIS

by

Chris Salter

Introduction

A total of 12.75 kilograms of metallurgical, and similar debris, was examined. Table 17.1 shows that the vast majority of the material (94.4% by weight) fell into four broad material classes;

Vitrified clay – mainly furnace/hearth lining
Low density slag
Dense iron-working slag
Metallic iron

A small amount of hammer-scale formed during the forging of iron, and some copper working debris were also recovered. The full description of the analysed samples is available in the archive report (see above, p. viii). IN sample numbers refer to the full descriptive record which is included in the archive.

Vitrified clay

Most of the vitrified clay was in the form of fragments of fired clay with a surface vitrification layer which, in some cases, penetrated up to 10mm into the body of the clay. This sort of surface vitrification is commonly seen around the hot zone of clay-lined metallurgical hearths. The high degree of vitrification seen in some of this material suggests that the hearths were being run at temperatures well above 1100C for prolonged periods. Although such conditions can occur in pottery and glass kilns, and even in house fires if there is sufficient draught, such debris is usually the result of some form of metallurgical activity. The main metallurgical processes that require these high temperatures are; the smelting of copper or iron, the melting of copper alloys prior to casting, the welding of iron (simple forging does

Table 17.1 Metallurgical and other debris from Nicopolis by material class

Class of Material	No of Fragments	Weight/g	Percentage of total weight
Copper-working	3	102.5	0.82
Fired Clay	15	88.1	0.70
Vitrified Clay	46	405.3	3.23
Low density slag	260	2622.9	20.92
Hammer scale	218	149.9	1.20
Smithing slag	298	7318.3	58.36
Iron scrap	89	1727.2	13.77
Possible iron ore	1	126	1.00
Unknown	34	102	0.81

not require temperatures in excess of 1000C). The presence of a few fragments of broken crucible and prills of copper alloy indicates that there was also copper working activity at Nicopolis. (See also above, pp. 59–64).

Low Density slags

Low density slags are most likely to have been produced by some sort of metallurgical process. They form when the clay furnace lining, or similar material present in the hearth, has been heated sufficiently to partially fuse and flow. The fusing of the surface can be promoted by the fluxing effect of alkali elements such as sodium and potassium present in the fuel. The resulting small slag flows or nodules are known as fuel ash slag (FAS). These fuel ash slags can be produced by both ferrous and non-ferrous metal-working, but also occurs in funeral pyres (Henderson *et al* 1987), as well as the other high temperature processes noted above in section A on vitrified clays. Even so, it is rare for low-density slag found in urban and semi-urban contexts to have been generated by non-metallurgical processes.

During blacksmithing, low density slag can be formed by the reaction of the fused hearth lining with the iron oxides shed from the hot metal surface and with any iron-rich smithing slag present in the hearth. Depending upon the degree of reaction between the bulk slag and semi-fused hearth lining, these slag sub-types are classed in the full slag catalogue as lining-slag reaction slag (LSR), or slag-lining reaction slag (SLR). The lining-slag reaction slags are those with a minor iron-rich slag contribution, and the slag-lining reaction slags (SLR) those where the iron-rich contribution predominates. In general, they tend to be darker in colour than the fuel ash slags, and have a different range of morphologies.

Dense Slags

Almost all the dense slags found were of types that are associated with blacksmithing activity. However, there was one slag fragment (sample IN 47, A 2221) which, on morphological grounds, could have been classified as a tap slag. Iron smelting technologies that produce tap slag produce slag in great quantities. However, small amounts of tap-slag like material can be produced during some blacksmithing processes: in particular, during bloom refining, where the raw metal (bloom) is forged into a billet and then into bar for use in artefact manufacture. (A billet is a semi-consolidated block of iron, which are often called ingots, an incorrect term since the word ingot implies that the metal has solidified in that form from the molten state whereas bloomery iron was never molten). Given that this was a small isolated sample of tap-slag, it must represent a by-product of blacksmithing.

Iron

The majority of material recorded as metallic iron was a mixture of fragments of blacksmithing waste and small, very badly corroded iron objects (probably nails). Amongst the blacksmithing waste were a number of fragments of steel; sample IN 102 (C 4116), sample IN 131, (C 4123), sample IN 244, a steel inclusion within a smithing hearth bottom (C 1105). The nature of these steel fragments suggests that iron smelting might have occurred in the vicinity, or at least, that there was a direct link with a source of primary metal (see further, below, section 4).

Summary of metalworking activity

It is difficult to estimate the scale and importance of the metal-working at Nicopolis, as only two hearths, both in area E, were the only ones found during excavation. One was used for blacksmithing during the primary occupation of the early Byzantine fortifications *c* 450–550 (Poulter 1995, 139). A second small hearth, probably used for copper-alloy casting, was also found on the inside of the curtain-wall and this dated to the second period of early Byzantine occupation *c* 550–600 (Poulter 1995, 143). An active general-purpose smithy would produce large quantities of dense slag, and hammer-scale, as well as a floor layer of trampled charcoal or coal if that fuel was available. For example, the floor layers of a late Iron Age smithy in the eastern gateway of Maiden Castle, Dorset

England (Salter 1991, 165–170) was estimated to contain approximately 200kg of hammer-scale and slag, with an unknown quantity dumped down the hill to the east (Wheeler 1943). The basilica at Caerwent, Gwent and Silchester, Hampshire both had extensive blacksmithies in their later phases, from which hundreds of kilograms of hammer scale and slag were recovered. In comparison, the 7.3kg of smithing slag and 0.15kg of hammer scale from all periods at Nicopolis would appear to indicate only a very limited amount of metallurgical activity, at least in proximity to the excavation areas. The total quantity of dense smithing slag recovered would have been equivalent to the amount of debris produced by 13–15 sessions of smithing activity. However, it is clear from the excavations that the metal-working debris came mostly from secondary contexts and this could explain why such a very small quantity of hammer-scale was found. Consequently, it is not possible to establish with any certainty what the level of metallurgical activity was at Nicopolis. However, the amount of copper-working evidence recovered was also limited. It therefore seems probable that both blacksmithing and non-ferrous metal-working were only carried out on a small scale.

Material by Period

Period 1, 100–150

Hammer scale, the surface iron oxide shed from the metal during forging, is so easily dispersed that it can be difficult to identify during excavation. Therefore, even the presence of a small amount of hammer scale means that it is highly likely that blacksmithing was carried out at Nicopolis even from the earliest years after the city's foundation; the largest quantity of iron working debris dating to this period came from the fill of an early pit (C 4116) on the northern side of the plateau (Poulter 1995, 78). Also found in the same context was a roughly ovoid fragment of corroded iron (95 by 85 by 32mm, sample IN 102 (C 4116). Although virtually completely corroded, sufficient of the structure was retained in the metallographic section to show the presence of massive iron carbide (cementite) plates. The metal would appear to have been high carbon steel. Its external morphology and its internal structure indicate that the metal had not been forged after its last heating cycle, and the internal structure showed that it had cooled relatively slowly at above 900 degrees C. All of which would indicate that this was a fragment of primary iron, possibly a bloom or billet. (See below, p. 301).

Period 2, 150–250

The metallurgical debris from this period consisted only of dense smithing slag fragments and scrap or waste iron (the type of material that survives relatively well). The context (C 4123) from which the material came was a occupation/dump layer and was clearly not *in situ*. Consequently, it is not surprising that the more fragile metallurgical debris types such as vitrified clay, low density slags or hammer scale were not found in what is clearly redeposited ironworking debris.

Period 3, 250–400

The presence of crucible fragments from two different areas indicates that copper working was taking place; sample IN 4, (K 4508), sample IN 1 (P 5021). The crucible fragments were of the same fabric type with a clean thin white body. This was protected from heat damage by a layer of less refractory clay applied over the external surface of the crucible. The additional layer had vitrified during melting the contents of the crucible.

An irregular fragment of glass with blackened surface was recovered, as well a few bits of glass like material. Unfortunately, the amount of material recovered was two small to determine whether it originated during glass-working, or accidentally during a fire which melted a glass object. However, the discovery of moils and glass waste produced during the manufacture of glass during the excavations does prove that glass manufacture did take place at Nicopolis. (See also Shepherd in Poulter 1999, 376–8).

Table 17.2a Weight of metallurgical debris by period

	Copper-working/g	Fired Clay/g	Vitrified Clay/g	Low density Slag/g	Hammer Scale/g	Smithing Slag/g	Scrap Iron/g	Possible Iron Ore/g
Period 1	-	-	13.0	17.0	4.1	553.7	374.8	-
Period 2	-	-	-	-	-	407.8	88.5	-
Period 3	88.2	2.7	116.0	138.8	145.8	2841.1	392.3	-
Period 4	-	43.4	36.1	389.6	-	1852.6	341.0	126.0
Period 5	14.3	42.0	240.2	2077.5	-	1663.1	530.6	-

Table 17.2b Number of fragments of metallurigical debris by period

	Copper-working	Fired Clay	Vitrified Clay	Low density Slag	Hammer Scale	SmithingSlag	Scrap Iron	Possible Iron Ore
Period 1	-	-	1	1	20	15	2	-
Period 2	-	-	-	-	-	11	3	-
Period 3	2	7	7	14	198	68	14	-
Period 4	-	3	9	30	-	36	7	1
Period 5	1	35	32	215	-	168	35	-

Much of the ironworking debris from this period is from the layers associated with a well-preserved Roman house in area M which was destroyed by fire towards the middle of the 3rd century (Poulter 1995, 194–8). The material includes hammer scale, lumps of corroded iron slag which included hammer-scale, and fragments of partially burnt iron; a mixture of material types typical for floor layers around a blacksmith's forge. Consequently, it seems likely that a forge existed close to or within the house shortly before its destruction.

Two more fragments of high carbon steel with large cementite needles, samples IN 213 (C 121) and IN 224 (M 4861) belong to this period. One sample, IN 213, was originally entirely metallic but now only the iron carbide needles remain uncorroded. The other sample was a mixture of slag and metal.

Period 4, 400–450

Although the total weight of slag recovered from contexts of period 4 weighed just under a kilogram less than the total recovered from contexts assigned to period 3, the relative proportions of most of the slag types remained similar. However, there are two notable differences: one was the discovery of one piece of rock suitable for use as iron ore, and the other was the absence of hammer-scale. However, the presence of iron ore on the site may not have any metallurgical significance for a number of reasons;

1. Iron ores can be used for a number of purposes other than being a source of smelted metal: chiefly as pigments, or as polishing abrasives.
2. Iron ores can form naturally as part of the post-depositional history of the site, through the development of a hard-pan layer. This is especially likely to occur close to deposits of smithing debris containing large quantities of hammer scale and waste iron.
3. Iron smelting produces very large quantities of characteristic slag, and as only one slag fragment with the morphology typically associated with smelting was found it is very unlikely that any smelting activity took place within or near the excavation areas.

Thus, in spite of the discovery of two of the prerequisite piece of evidence needed to identify iron smelting, it is clear that when the evidence for metal-working debris as a whole is considered, there is no reason to conclude that iron-smelting was carried out at Nicopolis. However, during the construction of an early Byzantine tower on the west side of the site, a mixed dump of material was brought in as make-up from the ruins of the Roman city, destroyed *c* 450 (Poulter 1995, 214–5). Material from this make-up dump (P 5018 and P 5051) suggests that there were hearths which were used for both ferrous and non-ferrous metallurgy. A sample of slag which was morphologically consistent with standard blacksmithing slag, sample IN 3 (P 5051) had surface traces of copper corrosion products. On further examination, it proved that the slag contained metallic prills of a lead-containing copper-alloy. A number of the fragments of furnace lining found in this same make-up as the iron/copper working slag were of an unusual form which showed a much greater depth of vitrification and sintering than those found in Area E (period 5). This implies that, whatever was happening, the process required a high temperature to be maintained for a considerable time. This would imply that metallurgical activity in the first half of the 5th century, as far as can be gauged from this deposit, was more concerned with copper- than iron-working. During normal blacksmithing the temperature in the hearth may rise to more than 1250C for short periods to get the metal up to welding temperature, before the hearth cools again while the object is being worked. However, if a large quantity of copper alloy (several kilograms) was being melted prior to casting a large object, quite prolonged heating would be required to provide sufficient heat to melt, and then give the metal sufficient super-heat to cast an object successfully. The presence of a mixed deposit of both ferrous and non-ferrous material indicates that a hearth had been used both for both copper and ironworking.

Period 5 – 450–600

The greatest weight of metallurgical debris was recovered from early Byzantine contexts. The composition of metalworking debris differs markedly from that of the proceeding periods. Low Density slag predominated over smithing slag. In area E, the presence of this Low Density Slag and unusually large quantities of vitrified clay, both relatively delicate debris types, corroborates the on-site identification of a metal-working hearth in that area (Poulter 1995, 139). Inspection of the slag demonstrates that this hearth must have been mainly used for iron-working.

Some of the vitrified hearth lining material had areas of blue or green glassy slag, indicating that some very high temperature processing had been carried out, probably the welding of a sizeable object, probably just north of the Large Basilica in area F (samples IN 168, 169, (F 3182). The number of smithing hearth bottoms or similar type of material recorded indicates that there were at least four cycles of blacksmithing.

The steel samples

A number of fragments of partially corroded steel were found in contexts ranging from the early years after the foundation of the Roman city (period 1) through to the early Byzantine period (period 5). The carbon content in those samples, where sufficient metal remained to determine its concentration, was over one weight percent. Nowadays, steel with this sort of carbon content could be classed as tool steel. These steels can be made extremely hard, producing excellent cutting edges, but they have the disadvantage of being brittle. In one example, the steel would have been particularly so, because the brittle cementite needles were massive, up to ten microns thick and up to several tenths of a millimetre long. One example, IN 102 (C 4116), was sufficiently complete to show that it was part of a billet, a block of iron produced by forging down a bloom. (A bloom is the initial product of the ancient solid-state or direct iron smelting process, an inhomogeneous mixture of metal and slag which has to be worked at welding heat to be rendered suitable for making artefacts). The presence of this material is most unusual. Until recently, it has been thought that, in Europe before the Industrial Revolution, steel was produced only by the carburisation of low carbon bloomery iron. This was because the bloomery iron-smelting process tends to produce iron with low carbon content. Indeed, experimental

Table 17.3 Weight of metallurgical debris by context/g

Context	Period	Copper Working	Fired Clay	Vitrified Clay	Low density slag	Hammer-scale	Smithing Slag	Scrap Iron	Possible Ore	Glass
2227	1			13						
2231	1						26.8			
4116	1				17	4.1	526.9	374.8		
4123	2						407.8	88.5		
631	3						68.8			
4121	3				8.9	0.3	319.6	196.4		
4124	3			94.1	22.2		192.8			
4508	3	87.2								
4834	3				13.2					6.7
4846	3				18.1					
4861	3			3.3		82.5	168.7	50.8		
4866	3					43.2	65.4			
4866	3		2.7	18.6	37.7		499.8	117.6	2.4	0.6
5021	3	1								
5306	3				5.4	0.9	610.7	11.6	0.2	
5309	3				14.1	18.9	612.1	6.6		6.5
5314	3							4.6		
5316	3						194			
5503	3				19.2		109.2	4.7		
2168	4						220			
2221	4						37.1			
3349	4				114.7					
3359	4				13.7		570.7	267.1	126	
3362	4		43.4				231			
4103	4				16.5		723.1	73.9	4.7	
5018	4				72.4					
5018	4			30.8	101.7		14.5			
5051	4						56.2			
5051	4				62.7					
5218	4			5.3	7.9					
1024	5	14.3								
1073	5			39.3	75.6		301.9	22		
1088	5			26.7	85.4		14.8			
1103	5		16.7	19.5	60.8		3.8	18.3		
1104	5			5	90.1		155.8	6.9		
1105	5		10.5	30.5	123.5		440.4	173.8		
1106	5				73.2					
3182	5		14.8	58.5	153.8		491.5	26.9		
4095	5			10.7			38.9			
4105	5				1315.8			240	33.6	1.6
5263	5			13.1	34.1		224.4	23.5		
5272	5			36.9	42.3			19.2		
5283	5				22.9					

reconstructions, such as those by Crew (1991), tend to produce low carbon iron with just the odd patch of metal with carbon content approaching 0.6 to 0.7 weight percent. Such bloomery iron is very ductile and can be worked easily but does not keep a good cutting edge. Various ways of overcoming this problem were tried. In the Iron Age of southern England phosphorus appears to have been used as a hardening agent (Salter and Ehrenreich 1984). Later, strips of steel were welded into the cutting edges to get a combination of the good cutting properties of steel and the ductility of the bloomery

iron. The exact source of the steel in the ancient world has been a matter of debate. One suggestion was that steel was produced by a small scale version of the cementation process used in the 18th century, in which the iron is heated together with charcoal in a closed container. The carbon from the charcoal would gradually diffuse into the iron, converting it into steel. But this was a slow process and a costly method of making steel. It has been suggested that another ancient method for producing steel cutting edges was by the selection of 'natural' steel produced within the bloomery furnace. In the bloomery process the metallic iron is never liquid and conditions within the furnace vary considerably. Some parts of the furnace would be sufficiently reducing to result in the absorption of carbon, and consequently the production of local regions of steel within the mixed mass of slag and iron (bloom). It was considered possible that, during the subsequent forging required to convert this rather intractable mass into useable iron, the smith could have learnt to distinguish and separate regions of high and low carbon iron. The ores of Noricum (modern Austria) were conducive to the production of such natural steel and this explains why, in Antiquity, this region acquired a reputation for the production of high quality metal. However, more recent experimental work (Crew and Salter 1997) has shown that bloomery steel can even be produced using British phosphoritic ores, previously considered to be totally unsuitable for the production of natural steel.

The shape of sample IN 102 suggests that it had been forged from a bloom. The presence of large slag inclusions within the steel indicates that the bloom-forging process needed to convert the raw metal of the bloom into metal that could be easily used by the smith was incomplete. The combination of brittle cementite and large slag inclusions would make this iron, in its present state, unforgeable at normal blacksmithing temperatures. Such a billet would still require skilled forging at temperatures high enough to soften the slag inclusions. If the temperature was allowed to fall the metal would rapidly become very brittle and liable to break. Indeed, it is likely that this fragment was formed by a fragment breaking off the main billet and becoming lost in the hearth, or on the forge floor. Even if the smith had noticed the fragment, he may have considered it too small to be worth the effort of trying to weld it back in to the main block. The presence of these pieces of high carbon steel may well explain the presence of so much heavily vitrified furnace lining and low density slag: the refining of blooms is a metallurgical process which requires the hearth to be maintained at high temperatures and for prolonged periods.

This type of high carbon steel bloom has not been reported extensively in the archaeo-metallurgical literature, mainly because archaeo-metallurgists have been more interested in finished artefacts rather than apparently worthless or discarded metal which is difficult to distinguish from slag. This discovery at Nicopolis, based upon the preliminary analysis of the samples (Poulter 1995, 24, 29), represents the first publication of direct evidence for the collection of 'natural steel' in the Roman period. However, recent examination of blooms and billet fragments from Roman contexts in Britain has produced two similar cases. One from an area of smithing activity in Roman Carmarthen, and another unstratified find from the Coleford area of the Forest of Dean which was, however, associated with Roman finds. In addition, very similar high carbon steel/slag fragments, together with prills of cast iron, has recently been found at a 5th–7th century bloomery/bloom-working associated with an early monastic site in Somerset (Salter 1997a). All these sites are in, or close to, zones of primary iron production. This is not surprising, when it is considered that the true worth of the metal can not be determined until it has been forged down into stock-bar. The semi-forged billets could contain excessive amounts of slag, or regions with such high carbon content that the metal was unforgeable. In addition, it is relatively easy to destroy a partially forged billet by injudicious forging (at too high or low temperatures). In the case of the billets from Nicopolis, one could expect that such metal would almost certainly have been forged into bar or strip before it was traded and possibly traded many times. However, there is no known iron-working industry within the region. This is supported by the recent experimental work (Crew and Salter 1997) which has shown that the overall carbon content of the steel falls as it is worked because of the oxidising conditions in a smith's hearth. It is not surprising, therefore, that the billet fragment (IN 102), which contains slag and has a high carbon content, had probably been worked only once or twice. This would suggest that the blacksmiths of Nicopolis had a direct connection with

an iron-smelting industry. One could push the argument further and suggest that the people who were smelting the iron were from Nicopolis and that they were the same people who were processing the semi-finished product at Nicopolis. The blacksmiths may have been involved in working the raw blooms up into bars for trade with other settlements. Such trade could have been on a purely local scale, in which the urban smiths were obtaining raw metal on a small scale for the requirements of the town and its immediate hinterland. The archaeological evidence, a small amount of metallurgical debris and temporary iron-working hearths, would suggest that the iron industry was small and self contained, not like the highly organised industries such as that at Hrvatska Dubrica in Pannonia (Durman 1997) with its trade in billets, and the Weald in England (Cleere and Crossley 1985). If Nicopolis was an important iron distribution centre, even if only for the immediate region, one might expect to find the extensive deposits of iron-working debris seen in some British Roman towns (Silchester and Caerwent). If such an industry existed, it should now be possible to locate – and possibly even date – such an industry without excavation, using archaeo-magnetic prospecting techniques (Crew 1997). However, it could be argued that such an industry could not have existed because there is no evidence for iron ores in the region. However, iron ore deposits, which could be used in the bloomery process, occur much more widely than ores that are suitable for modern smelting techniques. The presence of material that could have been used as ore at Nicopolis, and in stratified deposits, means that there is a possibility that there was a local iron industry in Antiquity which has not yet been identified. But until a survey of possible iron-working sites in the surrounding region is carried out, the source of the raw iron and steel found at Nicopolis remains unknown.

Summary

The examination of just over 12kg of metallurgical debris revealed evidence of both copper- and iron-working. A limited amount of copper-working evidence was recovered in the form of crucible fragments and slag containing copper-alloy droplets. The iron-working debris demonstrated that there was a limited amount of smithing activity in the vicinity. The greatest quantity of iron-smithing slag was recovered from contexts belonging to period 3. Comparing the relative proportions of debris types from period 5, it seems that contexts of this period contain more low density slag and vitrified clay and less dense iron-working slag. This suggests that metalworking in the early Byzantine period was more concerned with non-ferrous than ferrous objects. Raw iron and steel were being worked during periods 1, 3 and 5 and this material included high carbon steel blooms or billets.

ABBREVIATIONS

IGBulg	Mihailov, G (ed) 1956–71. *Inscriptiones Graecae in Bulgaria repertae*, volumes I–IV, Sofia,
Iatrus I	Dimova, V *et al* (ed) 1979. *Iatrus Krvina: spätantike Befestigung und frühmittelalterliche Siedlung an der unteren Donau, I. Ergebnisse der Ausgrabungen (Iatrus-Krvina)*, Berlin
Iatrus II	Bőttger, B *et al* (ed) 1982. *Iatrus-Krivina: spätantike Befestigung und frühmittelalterliche Siedlung an der unteren Donau, II. Ergebnisse der Ausgrabungen 1966–1973*, Berlin
Iatrus V	Von Bülow, G *et al* (ed) 1995. *Iatrus-Krivina: spätantike Befestigung und frühmittelalterliche Siedlung an der unteren Donau, V. Studien zur Geschichte des Kastells Iatrus (Forshungsstand 1989*)
Novaensia	*Novaensia: badania Ekspedycji Archeologicznej Uniwersytetu Warszawskiego w Novae*, Warsaw, 1987–
Tropaeum Traiani I	Barnea, A and Barnea, I (eds) 1979.*Tropaeum Traiani I: Cetatea*, Bucharest
Tsarevgrad Turnov vol 2.	Kr. Miyatev (ed) 1974. *Tsarevgrad Turnov, Dvoretsut na bulgarskiteTsare prez vtorata Bulgarska Durzhava, tom. 2: Keramika, bitovi Predmeti i Vuoruzhenie, Nakiti i Tukani*, Sofia

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